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Cover: David Goodman surveying the Giza Pyramids south of the Second Pyramid of Khafre.

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EXCAVATIONS AT MERSA MATRUH, SUMMER 1985

Members of the University of Pennsylvania conducted two months of survey work and excavation at the coastal town of Mersa Matruh from May 29th through July 19th. The mission, which consisted of a staff of eight directed by the present writer, owes a great debt of gratitude to Dr. Ahmed Kadry, Chairman and President of the Egyptian Antiquities Organization for providing the initial support for this project as well as facilitating every facet of our stay in Egypt. We also wish to express our gratitude to Mr. Kamal Fahmy, General-Director for Antiquities of the Western Delta, whose welcome visit to Mersa Matruh toward the end of our stay contributed fresh understanding of the significance of many aspects of the results of our fieldwork.

Our expedition was, moreover, ably assisted throughout the season by Mr. Azzat Osman, Chief Inspector for Eastern Mersa Matruh, as well as other members of the local Department of Antiquities, who helped as watchmen, carpenters, and in various other capacities. Finally, the Pennsylvania Expedition owes its particular thanks to Mr. Feisal As-Mawi, Director of Antiquities, Mersa Matruh Area, who assisted us at every turn and to whom a large measure of credit must go for whatever successes we have achieved during our recent stay.

Scope of Project

The purpose of this summer's initial season was to survey the eastern end of the lagoon that lies to the east of the town's modern harbor and to carry out a series of excavation tests of the surface of the small island occupying the east end of the lagoon, originally investigated in 1914 by the American archaeologist, Oric Bates (for the results of this work see Harvard African Studies 8, 1927, pp. 125-197).

The survey aspect of our work was undertaken by the team's initially exploring the beach and adjacent sandstone ridges that define the area lying to the north, east, and south of Bates' island. This brought to light a number of features, of which some had already been noted by Bates at a time when the town of Mersa Matruh consisted of less than twenty-five houses. The chief elements surveyed south of the island were a set of rock-cut steps, flanked to their east by a small underground chamber equipped with a niche and drainage canal (henceforth Area III). Further south up the sandstone slope flanking the lagoon were discovered isolated surface concentrations of Hellenistic and Roman period sherds that argue for the existence of some form of suburban extension of ancient Paraetonium, the Greco-Roman name of Mersa Matruh, in its later period.

Directly east of the island rises today a low outcropping of weathered sandstone, which would have been surrounded by water

during the winter months before the construction in 1965 of a causeway to separate the modern harbor from the eastern lagoon. The southern slope of this outcropping (designated Area II) is marked by a scatter of sherds. Most appear Roman in date, but, significantly enough, the zone also produced a limited number of Greek black glaze sherds, dating between ca. 600 and 350 B.C. The implications of this data are discussed below.

Finally, on the northern shore opposite the island the sandy beach rapidly gives way to the distinctive sandstone ridge that separates Matruh's series of lagoons from the sea. A rocky hillock (now Area V) was investigated as part of our overall survey, during the course of which we discovered that its top is occupied by the ruins of a substantial building, roughly square in plan and containing the outline of a number of interior rooms. Traces of plaster still adhere to at least one set of interior walls. Stairs led up the hillock's east slope to provide access to the building. Remains of a possibly undug rock-cut chamber tomb are visible on its north slope, while two apparently partly collapsed burial dromoi pierce the opposite, south slope. Roman sherds are in abundance across the top of Area V as well as down its eastern and southern slopes.

In order to mark a proper record of the position of these features as well as to document accurately the overall setting of the island, a good portion of the early work of the expedition went into executing a series of survey plans in various scales (from 1:2000 down to 1:20) of the above-mentioned features. The entire eastern third of the East Lagoon is now accurately surveyed at the 1:2000 scale. Underwater depth measurements relevant to Bates' Island were recorded as part of this aspect of the survey.

The remainder of our work was directed toward excavating key areas of the island, which, thanks to Bates' pioneer work, held out promise of producing a significant range of occupation levels. Before, however, any excavation could be undertaken, the island had to be accurately surveyed. This was done with a ten m. square grid laid out across the island's surface. The grid is oriented to true north. Semi-permanent iron rods were set across its surface to facilitate further investigation. Stone cairns mark their approximate location. The island survey plan that records its principal terrain features and all architectural elements was drawn at 1:100 scale. A reduced copy of this plan accompanies the present report.

By the end of our work a total of nine trenches had been opened. Some of these have been partly refilled to protect their walls until next season.

Geomorphology

The geological history of Matruh's lagoon system in general and especially its Eastern Lagoon, island and surrounding environs

is beyond the competence of the present writer to review accurately but should at some future date form the subject of a proper study. Some preliminary observations are, however, in order at this time. The lagoon, as already stated, is separated from the Mediterranean by a sandstone ridge, which, unlike the ridge extending west of the modern harbor (i.e., the area of "Cleopatra's Bath," etc.) is largely swept bare to bedrock and shows few traces of human occupation. To this extent, our Area V is something of an exception. Sand and salt flats only a few centimeters above water level lie to the east of the lagoon's east end, with Area II raised up above the surrounding plane. The flats lead directly to a second eastern lagoon and presumably during the winter months are still covered with water; prior to the causeway's construction they were without any question seasonally under water, leaving Area II a temporary island.

The island today measures ca. 135 m. NE by SW and ca. 55 m. NW by SE. Its maximum above-sea-level elevation is 6.10 m. Like the ridge to its north and Area II to its east, the island is formed out of layers of granular sandstone that present a wind-eroded scarp along its western face that has been largely denuded of any accumulation of sand. The axial crest of the island and its flattish NE extension is covered with layers of sand fill that in places collectively reach over two m. depth over bedrock. With the exception of a restricted argillaceous fill recovered close to bedrock, the successive fills are made up of various types of sand rather than humus.

Examination of the water surrounding the island on a calm day makes it clear that a sandstone shelf continues its perimeter out on all its sides to a considerable distance before receding under the sandy floor of the lagoon bottom. Clusters of sherds off the E, SE shore of the island as well as off its NE point, together with a stretch of ashlar wall again located off the NE end of the island on the underwater shelf make it strikingly clear that there have been times in its history when the "island" was perhaps twice as large as it presently is, if indeed it was not connected to the eastern beach by an isthmus. Since, moreover, living observers claim to remember seeing the island connected to the beach since Bates' day (when it was separated), it is further apparent that the combination of seasonal weather, gradual climatic change, and the activities of man have caused the lagoon, flat lands and island to change shape continuously since the Bronze Age.

Our understanding of this phenomenon is in its infancy. Archaic Greek through Roman period sherds from trench I8 III/S excavated just a few centimeters above present-day water level at the NE end of the island prove that the latter was at least as much out of water throughout much of Classical antiquity as it is today. It is worth recalling here that the water level in the harbor of Mersa Suza, ancient Appollonia, port of Cyrene in Eastern Libya, is two to two and a half m. higher that it was in the Roman

imperial period. This observation is in conformity with what we know from our own retrieval of Roman period sherds and a Greco-Roman ashlar wall located off the N. NE shore of the island and adds substance to the proposition that the island stood attached to the land after the Bronze Age. Whether it did so during the late second millenium and what implications this has for the relations, whether peaceful or defensively-minded, of the island's Aegean occupants with the native Libyans remains to be determined.

Bates' Activity and the Recent History of the Island

The work of the American at the outbreak of WWI needs only be reviewed for what it contributes to the present project. Bates himself appears to have spent little time on the island, having delegated its excavation to his assistant, Harding-King. His architectural and stratigraphical observations create perhaps as many problems as they solve. Nevertheless it is to him that we owe our knowledge of its Late Bronze Age occupation as well as the rough outlines of its later levels.

What Bates achieved was the partial clearance of the roughly square house dominating the NW end of the island's upper crest or ridge. This he correctly surmised was of recent vintage on the basis of a reversed stratigraphy he reports recovering from its interior, dating perhaps to the 17th. or 18th. centuries. His sketch plans of this structure are wholly unreliable.

His retrieval (and proper identification at a time when its study was only first being undertaken) of Cypriot White Slip ware from test trenches opened up in the building's NW corner and directly outside to the west provides a more lasting contribution, and nothing has been found by the present expedition to undermine his essential conclusions.

Bates did, however, propose to name his island the Island of the Jew, or Gezirah-t al-Yahudy on the strength of two local legends current in his day, which, in the more thought-provoking version of the two stories, linked the island with two Jewish gold-smiths of indefinable antiquity. Nobody today appears to remember either story, and the island is simply referred to by the rather prosaic title of Desert Island. It is therefore our proposal to drop the anachronistic name, Island of the Jew, and to rename it instead, in honor of its original investigator, simply Bates' Island.

Either before Bates' time (in which case he was unaware of the fact) or shortly after his 1914 departure the island was used as a base for Greek sponge divers, who probably had something to do with the construction of the previously mentioned ruined house investigated by Bates. The island was heavily fired-upon during WW2 and Bates' house was apparently used as a dug-out emplacement; it may have been hit by a bomb or artillery round.

The hastily buried surface remains of a man were found in trench E4 IV. Local memory says that it belongs to a German soldier.

More recently, the island is used in the fall months for hunting migratory birds. Much of Bates' house has been pulled apart since his day to furnish stones for duck blinds.

Results of the Excavation

Arab Period Levels

Bates' House (S101)

The most tangible remains of Arab period occupation are those of Bates' house, which has been significantly pulled apart since 1914. Measuring ca. 11.90 by 12.37 m., its plan is that of an irregular square. No traces remain of its earlier division into two rooms, while its N. wall, which in Bates' day contained a door, is largely dismantled. The walls, averaging 0.80 m. in width, are founded over sandy fill and nowhere extend to bedrock. Their construction consists of mostly rubble sandstone blocks, interspersed with pieces of squared-off ashlar blocks that presumably were part of a now dismantled ancient structure. A voussoir-shaped block has been integrated into the fabric of the east wall; a well-preserved sandstone triglyph fragment was discovered on top of the west wall. Laid up in rough courses, its walls are nowhere preserved to more than three courses high.

This summer's mission did not attempt to excavate the entire interior of Bates' house, which, owing to Bates' own activity, coupled with the scavenging activities of modern hunters on top of its deep WW2 crater, holds out little hope of producing a coherent stratigraphy. However, two tests were conducted on its interior: trench G5 IV, SW Test against its south wall and trench H4 III against its west wall. It is significant that, while both trenches failed to provide direct evidence for the construction date of Bates' house, they, combined with the cleaning operations extended over its interior surface and outer walls, collectively produced the biggest concentration of Late Bronze Age and Archaic Greek sherds thus far unearthed. Presumably important occupation levels and perhaps structures belonging to both phases occurred on the site of the later house. Many of the sherds were brought to the surface by Bates himself and by later disturbances.

Previous Arab Occupation:

Trench G5 IV, SW Test contained a 25/30 cm. thick layer of greyish sand over which rose the south wall of Bates' house. This contained a heavy concentration of plain white wall plaster fragments, mixed with several kinds of Islamic pottery. The latter includes pieces of glazed vessels, decorated in yellow, green, brown, and purple-black colors with floral designs and abstract swirl patterns. The same level contained two bronze religious medallions, decorated with images of the Virgin Mary

and inscribed in Latin. These latter artifacts may tentatively be associated with Maltese sponge divers perhaps in turn associated with the Greek divers known to have used the island. The level clearly precedes the construction of Bates' house. Its heavy concentration of wall plaster suggests that an earlier house was pulled down to facilitate the erection of the present house.

The same fill appears elsewhere under the extant walls of Bates' house as well as in trench G6 I located a short distance to the east.

Roman Levels

Apart from what can be surmised from the occasional odd architectural fragment (e.g. voussoir block; triglyph fragment) that came to be reused in Bates' house, along with the underwater ashlar wall and sherd concentrations already mentioned, evidence for a Roman period development of the island derives mainly from the lamp and pottery sherds excavated in trenches I8 III/S, G6 I, G5 IV, SW Test, and F4 III. It is notable that no identifiable Roman bronze coins were found, and indeed the total number of coins found in nearly two months of excavation is remarkably low: one, possibly two bronzes. In comparison, moreover, with the surfaces of Areas II, III and V, the surface of Bates' island is rather sparsely provided with Roman period pottery, particularly the various easily recognized corrugated wares (second to fifth century A.D.?) that are virtually omnipresent on the surfaces of the majority of Marmaric coastal sites.

Despite this general paucity of finds, several excavated wall features can be stratigraphically associated with the Roman period. Perhaps the most intriguing were unearthed in trench G6 I east of Bates' house. Nine enigmatic small rubble-stone foundations were built on fill containing corrugated wares. Their relationship to this fill, however, is still under study and the possibility remains that at least some of the foundations are earlier (i.e. are Hellenistic Greek). In plan these foundations resemble the Greek letter "pi". An accumulation of animal bones in the fill burying the foundations opens the possibility that they have something to do with sacrifice, although other, more pragmatic explanations could be mooted. Their overall setting remains to be clarified, but at the present time they appear to have been set out in an open-air courtyard.

The second important Roman period architectural feature came to light in trench I8 III/S close to the shoreline at the NE end of the island. The area in question is part of the saddle of land that gradually slopes down toward the island's tip and the underwater sandbar that presumably marks the isthmus connecting the island to the land during later antiquity. I8 III/S is therefore much closer to sea-level than it was during the time in question.

What emerged across the upper level of the trench is a stretch of approximately E-W rubble wall that originally formed a corner at the trench's edge to turn ninety degrees to the west. The resulting structure is designated S105. What survives is mainly rubble foundation; the bulk of its superstructure has been removed. Flat paving stones grouted together with cement that are preserved at the western edge of the trench appear to be associated with S105, but only future excavation will reveal their actual relationship. A fragmentary mould-made lamp and corrugated sherds point to a Roman imperial period date, further corroborated by the discovery in associated fill of a piece of painted wall plaster, decorated with a bird's head. In addition to the latter discovery, large quantities of a plain white wall plaster were excavated from the same context. These may have provided an outer surface to the otherwise largely missing superstructure of S105. They in turn may have provided a structural link with a stretch of unexcavated wall surveyed in gridsquare J8 II.

Hellenistic Levels

Trenches G6 I and I8 III/S again provided the bulk of walled remains and ceramic deposits that document the island's Hellenistic phase, which appears to continue without any noticeable interruption in occupation directly into the Roman imperial period. Of the two I8 III/S provides the clearest evidence in the form of two structures, S106 and S108 respectively, whose lines were cut away by the Roman period builders of S105. S106 consists of two walls; its longest surviving wall runs NW by SE to form a right-angle at the western edge of the trench. Their width is ca. 0.50 m. Laid up in distinctive courses of dry rubble masonry, both survive to a maximum height of three courses. The individual blocks have been carefully selected for their flat upper and lower surfaces but do not appear to have been hammer-dressed, which may have been the case with at least some of the stones used in the foundation of the Roman period walls, S105.

Once again the dating of these walls relies on largely ceramic evidence. This includes an echinus bowl, the base of a steep-walled bowl, a base fragment with red slip drips, all dating to the second century B.C., together with several Hellenistic amphora fragments. Elsewhere, trench G5 IV, SW Test had a large body fragment of an open black glaze bowl; the glaze is a streaky metallic paint of greenish-black tint that presumably places its production in the Hellenistic period.

Archaic Greek Period Levels

Ironically, the greatest concentration of Archaic wares, whose appearance provided perhaps the greatest surprise of the season, came from the area of Bates' house where the disturbed conditions of the latter's interior precluded our recovering any useful stratigraphical context. The pieces include an Archaic Attic cup rim, a fragment decorated with a swastika, and a rim fragment

from an Archaic kotyle that appears to belong to the same vessel that Bates recovered in 1914 and had sent back to the Peabody Museum at Harvard University. The last two fragments are of probably East Greek manufacture. All three date to the sixth century B.C.

A mixed deposit in trench F4 III yielded a section of an Attic lamp and an inscribed jar neck. The inscription, which was scratched on the surface after firing reads "--MAN". Again, no walls could be associated with the finds.

In I8 III/S, however, a small segment of rubble wall (S112) brought to light beneath the lines of the Hellenistic (S106, S108) and Roman (S105) walls. Lying at a level just above the water level of the nearby beach (which will undoubtably cause complictions for its future clearance), S112 is made up of large, carefully selected stones, whose size distinguishes them from the later walls. Although discovered during the last days of the excavation and therefore only partly cleared, their appearance is similar to the Archaic period walls from the Demeter Sanctuary and Artemisium at Cyrene.

S112 is stratigraphically separated from the later walls that partially override it, and this would seem to argue for an interruption in occupation of the site between the Archaic and Hellenistic periods. Indeed, our evidence for activity on the island during the Classical, fifth and fourth centuries B.C. is limited to a single Red Figure Attic sherd that turned up in E44 IV, and which, taken by itself, argues little. The only Archaic sherds (three in number) from I8 III/S were recovered from deposits that were stratigraphically separated from S112, but their presence nearby, taken together with the depth and distinctive appearance of its masonry, make it reasonably certain that S112 should be assigned a late seventh/sixth century B.C. date.

Bronze Age Levels

The principal goal of this summer's expedition was to confirm Bates' contention that the island was the site of a Late Bronze Age settlement. This was accomplished to a remarkable degree.

Bates' evidence was limited to a small number of Late Bronze Age White Slip Ware sherds made on Cyprus. Not surprisingly in light of the limited amount of time he spent in investigating the island, he found no walled remains earlier than the Arab period.

There now exists a vastly expanded range of Late Bronze Age ceramic wares from a variety of contexts from the island. These have been identified by the expedition's pottery expert, Pamela Russell, as Mycenaean (probably LH IIIA and perhaps LH IIIB), Minoan (LM IIIB), Base Ring I and Base Ring II from Cyprus, Red Lustrous, White Shaved, perhaps White Painted Wheelmade III, and perhaps Cypriot utilitarian types such as Plain White, Pithos, and Cooking Pot wares.

In addition to the pottery a fair number of bronze samples were recovered from the island's Bronze Age levels, plus a limited number of fragmentary artifacts including a well-preserved spear point. The surface, particularly in the area of Bates' house, produced nearly a dozen terracotta crucible fragments; some still have bits of bronze detritus adhering to their surface, which makes it clear that their purpose was to cast bronze artifacts (like the spear point just mentioned?). Their surface context leaves open the question of when these crucibles date. They can be tested for a thermoluminescence date, and hopefully future excavation will yield stratified examples. In the meantime, the stratified bronze lumps and artifacts from early contexts raise the possibility that the island was used for manufacturing objects in bronze to use in exchange with the native population.

Although the final analysis of all layers is still awaiting its completion, the best candidates for uncontaminated Bronze Age strata occur in trenches E4 III and F4 III. The former produced from its 2.3 deposit a miniature Mycenaen hemispherical bowl decorated with horizontal bands and the rim of a standard Late Bronze Age type lamp. The same trench contained a number of sherds that may eventually turn out to be of local (Libyan?) manufacture. Its 2.4 deposit produced three Cypriot fragments. Similar wares, including White Slip and Base Ring were found in some abundance in F4 III.

The disturbed fill from Bates' house again yielded the greatest number of Cypriot White Slip sherds, increasing our total sample to approximately 150 fragments.

According to Ms. Russell, the White Slip material belongs to the period designated Late Cypriot IIA2 and Late Cypriot IIB. The Base Ring I and II material fits into the same time frame. This may provisionally said to yield the absolute dates of 1390 -- 1320 B.C. In Pharonic terms, this would be the latter part of the Eighteenth Dynasty.

The architecture from this period in trench E4 III took the form of a small chamber, measuring internally ca. two N-S and 2.5 m. E-W; its designation is S102. The west wall remains to be fully clarified, as does its purpose. The structure was, however, provided with a hard earth floor. The walls were made up of randomly sized rubble stones, laid with no strict attention to coursing.

Trench F4 III contained another small Late Bronze Age structure (S107), basically rectangular in plan, with slightly rounded corners. Its overall measurements are 2.0 and 2.5 m. Broad, flat stones, held together by a sandy mud, were used for the walls, whose inner faces appear to have been covered by a coarse white plaster. An interesting oven was found in the NW corner of S107. It was built from flat stones set on their thin edges and then lined with terracotta. It may have had a crudely domed roof. An open (?) area north and west of S107 was paved with flat flagstones.

Constructional Techniques

To recapitulate what has been already stated, the island's basic occupation phases present the following types of building techniques.

1: Bates' House
Mixed rubble construction, laid dry, combined with reused Roman period (?) ashlar blocks and broken architectural members.

2: Sponge Divers' House
No trace of walls. Only coarse white wall plaster survives.

3: Roman
Rubble, hammer-dressed, normally laid dry but occasionally bound by cement. Cemented paving stones. Ashlar construction (?). Marble and painted plaster wall revetments.

4: Hellenistic
Rubble masonry, laid in recognizable courses. Mixed dimensions.

5: Archaic Greek/Libyan II
Moderately large rubble stone construction, laid dry.

6: Late Bronze Age, Libyan I
Rubble masonry, with stones of mixed dimension, packed with sandy mud or left dry; no clear-cut coursing. Trampled earth floors; paving stones. White wall plaster. Terracotta-lined ovens.

Conclusion

Perhaps the most striking feature of Bates' Island is its cultural diversity. It will undoubtably some day play its role in elucidating Paraetonium's Hellenistic and Roman phases which still await their final exposition, and indeed the excavation of the Area V hilltop structure should go some distance in clarifying the general development of the sector around the Eastern Lagoon during the town's imperial phase.

Most sources associate Paraetonium's emergence into the historical stage with Alexander's celebrated swoop into the desert to consult the Oracle of Ammon at Siwa (cf. Bates, Harvard African Studies 8, p. 129). The results of this past summer's work extend into the past contacts between the historical Greeks and the site of Matruh by some two hundred and fifty to three hundred years, with interesting implications for the Cyrenaican Pentapolis west of the Marmarica. This is not to argue that we have discovered a Greek foundation. A few random sherds and a short length of rubble wall give little clue as to the identity of the early town, which in all likelihood had a predominantly Libyan character. What is of significance in this context is the lack of any obvious traces of Late Dynastic Egyptian overlay. In any event, the further discovery of Archaic data must be given a high priority in any future planning.

We know that the Bronze Age island was subject to the same seasonal rise and fall of sea level as is the case today, without the moderating effects of the modern harbor causeway.

In the absence of any compelling evidence to the contrary, we have to assume that the island was in fact an island during the fourteenth century B.C. just as it is today. Certainly no White Slip or Base Ring has been observed on the ground surface around the eastern end of the lagoon to suggest that the island was linked by an isthmus to the eastern shore by Area II. During the wet months of the winter the native Libyan element, conventionally referred to as the Thehenu, must have practices seasonal transhumance and retreated with their flocks to the south. Dry weather forced them back to the coast.

Bates thought that he had discovered a small Libyan necropolis along the stony ridge ca. a mile and a half SE of his island. The site was revisited this past summer, and I would like to take this opportunity to suggest that its further exploration should be undertaken next season. Certainly the presence of Late Bronze Age Libyans this close to what appears to a Cypriot trading post raises many interesting questions worthy of investigation. We ourselves feel that some of our earliest pottery must be local in origin, and if that proves to be the case, its manufacturers must have been Libyans.

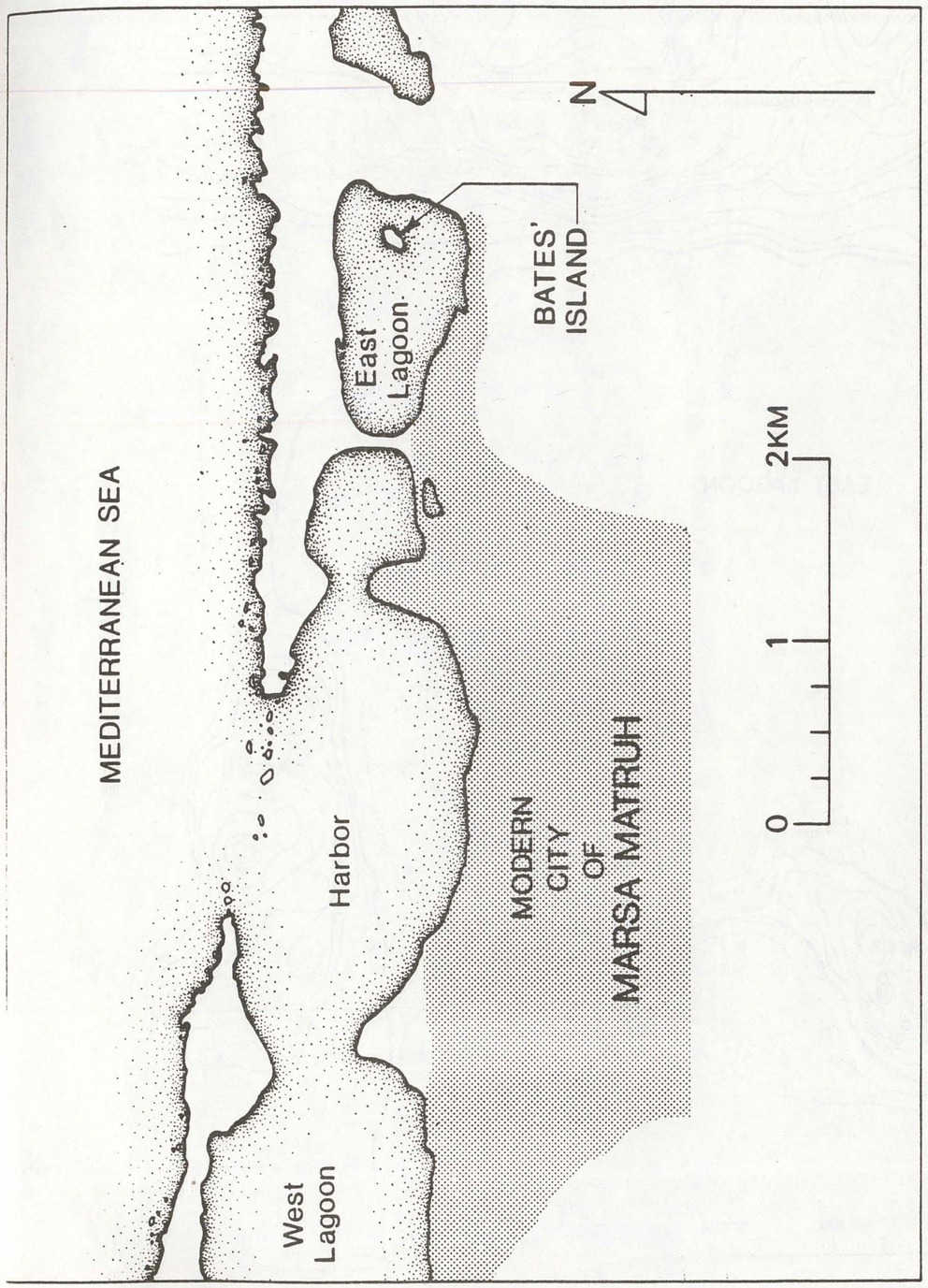
It is likely that the people making use of the island avoided this coast during the stormy winter months (two months of summer wind were enough to make the present writer realize what an important factor the weather can be for the utilization of such a small, unprotected eminence at the end of the funnel-shaped lagoon), and the bulk of the contact between the island inhabitants and the Libyans must have occurred during the late spring and early fall.

This raises the question of what was the nature of the contacts between both parties. Much more must be learned from the island before any definitive answer can be undertaken. To date, however, we have isolated very little evidence for what the island occupants received from the Libyans in return for their ceramic and metal imports, apart from ostrich eggs, pieces of which were excavated from all levels on the island. To this may be presumably further added grain, meat, hides (?), and, above all, fresh drinking water.

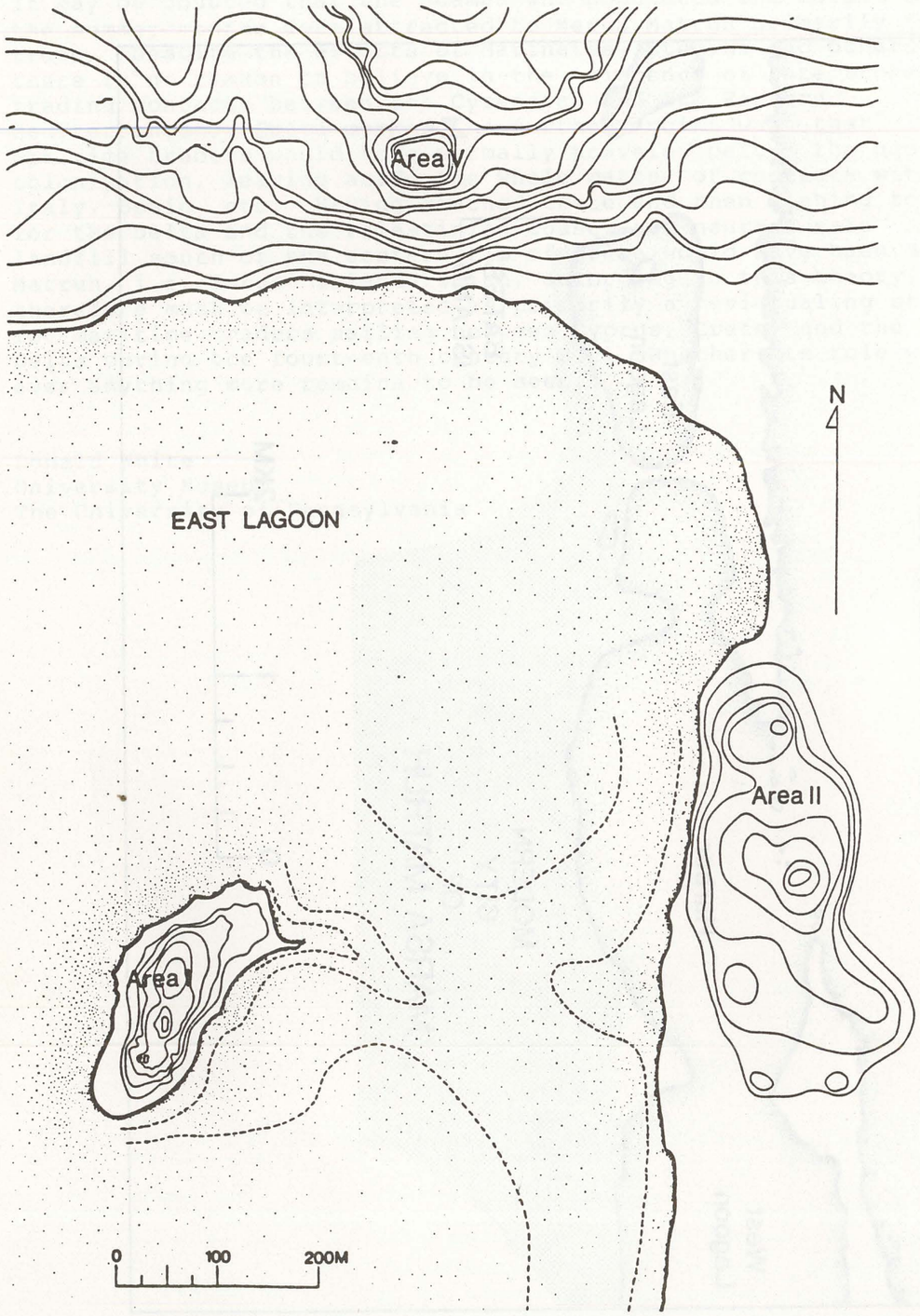
The fourteenth century century B.C./later Eighteenth Dynasty chronology for the island's Bronze Age occupation suported by the Cypriot vases predates the years of intensive Libyan aggression against the Egyptians during the reigns of Merneptah and Ramesses III, and the islanders should not be confused with the notorious "Peoples from the Sea." But they may have been their precursors, setting the stage for the alliances of a century later.

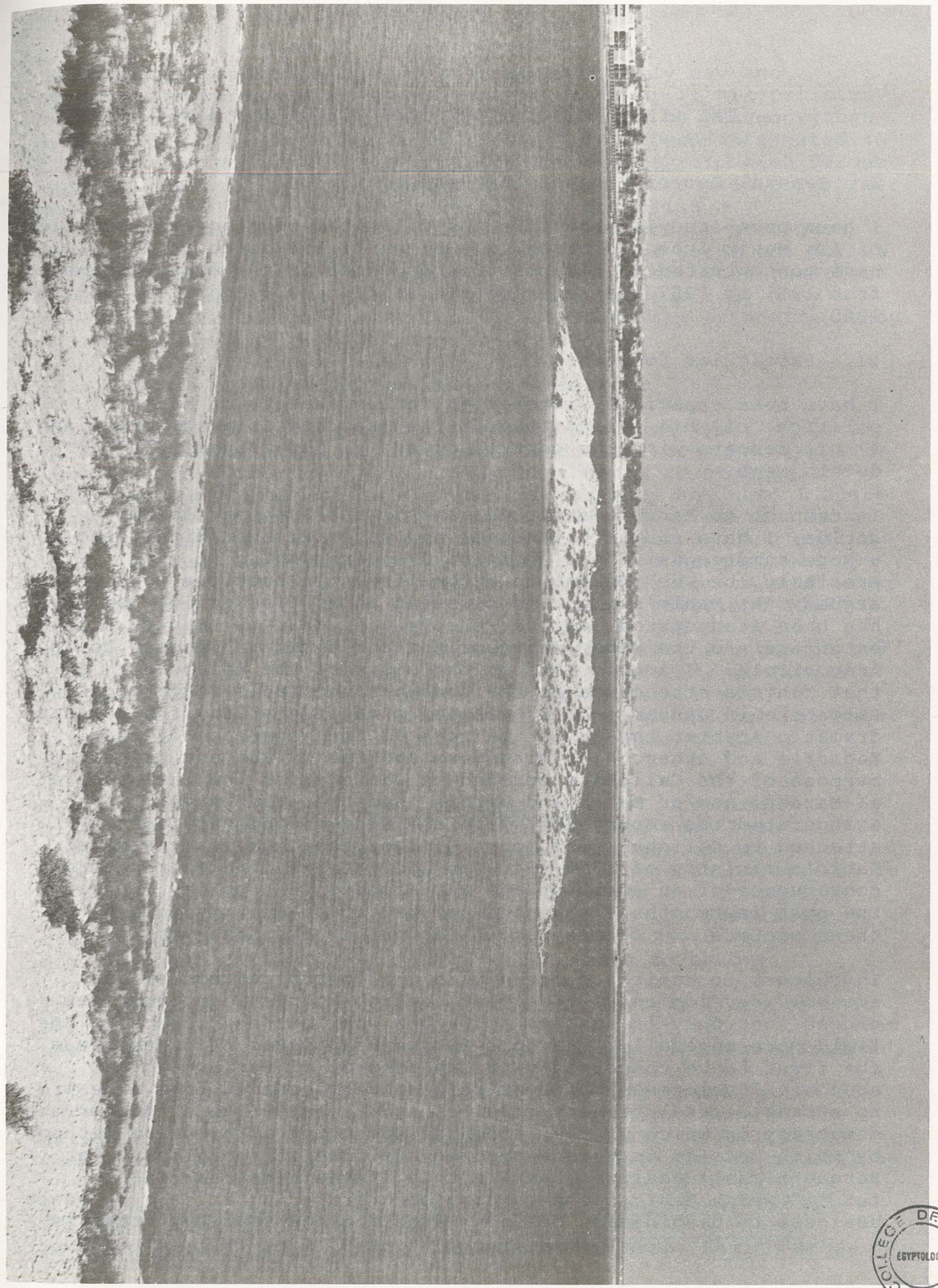
It may be doubted that the seamen who populated the island during the summer months were attracted to Mersa Matruh primarily for trade. Despite the efforts of Marinatos, Stucchi and others, there is no reason to believe in the existence of Late Bronze Age trading contacts between the Cyrenaica and the Eastern Mediterranean. Crete marked the furthest point west that maritime traders would have normally traveled before the age of colonization, leaving aside the whole matter of contacts with Italy, Spain, etc. Having reached Crete and then wishing to make for the Delta and the Palestinian coast, the nearest safe landfill south of the eastern tip of Crete would have been Mersa Matruh, i.e. Bates' Island, which, according to this theory, therefore must be interpreted as primarily a revictualing station for maritime traders sailing between Cyprus, Crete, and the Nile Delta during the fourteenth century B.C. Whether its role was ever anything more remains to be seen.

Donald White
University Museum
The University of Pennsylvania



MARSA MATRUH, C. BEETZ 9/85
ABOUT 1:2500





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THE LIFE AND POLITICAL IDEOLOGY OF ALI MAHIR

I. General Description of the Research

I have been studying the life and political ideology and practice of Ali Mahir from his birth in 1881 until his death in 1961. I have concentrated on his politics as Chief of the Royal Cabinet from 1935 to 1937 and as Prime Minister in 1936 and from 1939 to 1940.

II. Particular Concerns

I have been especially interested in two aspects of Mahir's politics: 1) his policy towards the Arab and Islamic worlds and, 2) his concern with the control of social and economic development.

In respect to Mahir's attitude towards the Arab and Islamic worlds, I have sought to uncover new material that might lead to a more comprehensive and definitive understanding of what, precisely, he was seeking to accomplish. In previous work I have argued that Mahir's vigor in pursuing an Arabist policy for Egypt has been exaggerated and that the Palace, that is, Mahir, his entourage and the King, was cautious and timid in respect to the Arab circle. I argued this on the basis of the following: 1) that Mahir's attendance at the London Round Table Conference on Palestine in January, 1939, was not a manifestation of a new and dramatic Arabist thrust on the part of the monarchy; 2) that Kedourie and others have misunderstood the nature and principal purpose of the Caliphate pursued by Faruq under the influence of al-Maraghi and/or Mahir and others, and that they have exaggerated the importance which the King and his advisors attached to Caliphal ambitions; 3) that the "luke warmness" of Mahir's ministry of 1939-1940 was not the inevitable or natural consequence of an activist and anti-imperialist policy. During the past few months I have endeavoured to re-open my file on these matters and to test and flesh out my previous work.

In respect to Mahir's concern with the control of social and economic development I have been seeking to break entirely new ground, not only in respect to my own work but in respect to the field more generally. Jacques Berque has argued that Mahir was the first to be concerned with the control of social and economic development but that this concern stemmed from a desire to strangle revolutionary impulses and to establish a counterfeit democracy in which we can recognize something akin to the methods by which Fascism in Europe opposed the rise of socialism. Yet Berque himself realizes that in this "faked rehearsal of the future" which Mahir seems to have been preparing it is a delicate business to distinguish between "artifice and reality," that is,

is difficult to know if Mahir represents a truly new and substantive thrust for change from the right or if his politics and ideology, in spite of new rhetoric, should be placed within more traditional Egyptian categories. I have been interested in differentiating between the artifice and reality of which Berque speaks. Was Ali Mahir an innovative social and economic reformer and visionary? Was he really seeking to establish a "semi-dictatorship to replace inadequate democratic procedures which hampered the country's development?" (the words are Marius Deeb's, from his work on the Wafd). In the past, such theories have been sounded, not only by Berque and Deeb, but by many others, but no one has, to my knowledge, made any extensive study of these issues in and of themselves.

III. My Use of Egyptian Sources and Resources

Periodicals. A great part of my summer has been spent at Dar al-Kutub reading Egyptian newspapers and magazines, particularly from the 30's and early 40's. This has been a rewarding but tiresome task, inasmuch as the lack of indexes, and here I speak primarily of newspapers, meant that I have had to spend a large amount of time leafing through papers month by month and year by year. My task was considerably lessened by the help of two Egyptian research assistants who worked with me for several weeks in July, and by the cooperation of the highly efficient staff of the Microfilm Department at the Dar. Some of the principal papers and magazines that I consulted, especially for the period 1935-1942, were: Akhir Saa; al-Ittihad; al-Akhbar; al-Ikhwan al-Muslimun; al-Ahram; al-Dastur; al-Siyasa; al-Siyasa al-Usbuiya; al-Shaab; al-Musawwar; al-Misri; al-Kashkul; al-Waqai al-Misriya; al-Wafd al-Misri; Ruz al-Yusuf; Misr al-Fata; al-Rabita al-Arabiya.

Books and Magazine Articles. Academic Works. Egyptian historians of modern Egypt and the Middle East have been producing many fine works for many years but the volume, sophistication, and general quality of this production seem to be increasing at a prodigious rate. Although one can attempt to keep abreast of new work even while living in the States, my visit this summer has convinced me that there is no substitute for frequent and regular visits if one wishes to become thoroughly acquainted with the latest works that have emerged. In an ARCE newsletter written as long ago as 1971 I argued that Western scholarly journals should make a greater effort to review new scholarship that was being written in Arabic. The situation has improved somewhat since then, but many really fine and helpful works go virtually undiscovered or are taken notice of only long after they have seen the light of day. Some of the delightful discoveries of my summer, and here I include works that are indispensible to my work on the modern period as well as on Ali Mahir more particularly, have been: Tariq al-Bishri, al-Muslimun wa al-Aqbat fi Atar al-Jamaa al-Wataniya, 1982; Muhammad Jamal al-Din al-Masadi, et. al., Misr wa al-Harb al-Alamiya al-Thaniya, n.d.; Muhammad Sabur Arab, Hadith Arbaa

Fabrayir, 1942, 1985; Hasan al-Karum, Urubat Misr Qabla Abd al-Nasir 2 vols., 1984; Ahmad Zakariya al-Shalaq, Hizb al-Ahrar al-Dasturiyin, 1982; Abd al-Wahab Bakr Muhammad, al-Jaysh al-Misri wa Harb Filistin, 1948-1952, 1982; same author, al-Wujud al-Britani fi al-Jaysh al-Misri, 1936-1948, 1982; Ali Shalabi, et. al., al-Inqilabat al-Dasturiya fi Misr, 1931-1936, 1981. A complete list would be very long indeed.

Books and Magazines. Memoirs. Lively and interesting memoirs continue to be published, about the inter-war and earlier periods, as always, but now, increasingly, and at an almost alarming rate, about the Nasserist regime in which Mahir played a role. It is, again, pointless to include a long list but brief mention of a few of the more engaging discoveries of the summer will convey the flavor of what I am speaking about: Muhammad Abd al-Halim, al-Ikhwan al-Muslimun:Ahdath Sanaat al-Tarikh: Ruwayat min al-Dakhil, 1928-1948 and 1948-1952, 2 vols., 1979 and 1981; Mustafa Amin, Min Ashara li Ashrin, 1981; Hasan Yusuf, Mudhakirat al-Qasr wa Dawruuhu fi al-Siyasa al-Misriya, 1922-1952, 1982; Wahid al-Dali, Asrar al-Jamaa al-Arabiya wa Abd al-Rahman Azzam (really Azzam's memoirs), 1982; Fathi Radwan, Ayyam ma Abd al-Nasir, 1985.

Published Government Documents. I have made extensive use of the transcripts of the Egyptian Chamber of Deputies and Senate from the late 20's into the mid-40's.

Discussions with Egyptian Scholars. I cannot do justice to the aid and guidance offered to me by many Egyptian scholars of the modern period. Their bibliographical knowledge, and their knowledge of the names and whereabouts of would-be interviewees, is always helpful, as is their advice in respect to the more elusive and subtle questions of theory and method and scholarly approach. I should here mention people who have been particularly helpful: Dr. Hasanain Rabia, an adjunct professor of ARCE, who, although a specialist in the medieval period, was able to get me off to a fast start; Dr. Abd al-Azim Ramadan, Professor of Modern History and Dean and Head of the History Department at Menufiyah University; Dr. Abd al-Aziz Nawwar, Professor of History at Ain Shams University and Director of its Center of Middle East Studies; Ramzi Mikhail Gayyid, an historian of the Egyptian press and an official at the Center for Contemporaroy History located at Dar al-Kutub; and Siham Nassar, also an historian of the Egyptian press who is now working on a Ph.D. at the University of Sohag. The warmth and kindness of these and many others have been extremely encouraging. My reception by Dr. Nawwar was typical. When I presented him with a copy of an article I had written on Egyptian Arab nationalism his interest and enthusiasm were obvious and, of course, deeply flattering. Could he take the liberty of presenting a synopsis of my article to the weekly symposium in modern history at Ayn Shams, could I possibly attend such a meeting myself in the future, etc., etc. I had never met the man before this summer but after being in his presence only a few minutes I felt as I were with an old friend.

Interviews. When I was in Egypt working on my Ph.D. thesis in 1969-1971, I was able to interview a broad range of figures who had known Abd al-Rahman Azzam (the subject of my thesis) and his ally Ali Mahir. During my stay during the last few months I saw some of these people once more and I was also able to make some new contacts. I might mention, in particular, Sabri Abd al-Majd, editor-in-chief of Mayu and a journalist of long experience who has written intelligently of Mahir in al-Rajiya al-Arabiya; Wahid Rafat, well-known lawyer and political commentator, a prominent member of the old and new Wafd; Fathi Radwan, member of Misr al-Fata in the 30's and hence especially knowledgeable about Mahir's politics in that period; and Ibrahim Faraj, a prominent Wafdist of the inter-war period who is now, despite his nearly eighty years, number two man in the new Wafd. I must confess that I did not interview as many people as I might have under other circumstances. Two causes can be given: the summer made it difficult to see people who were on vacation for all or a part of these months, and I wanted to hold off interviewing some people until I was more familiar with the written sources on Mahir. I intend to return to Egypt next year and should then be prepared, after a year of sifting through the material I have garnered, to pursue further interviews.

Documents at the Dar al-Wathaiq at the Qala. I have applied to look at these documents but, as of this writing, I have not received permission to do so. My first conversations with Egyptian friends left me with mixed impressions as to their possible usefulness. I was told, variously, that they were difficult to use, that not much was there, or that there was little that would be relevant to my interests. However, after having read some of the new books that have made use of these documents, and after having been shown the index at the Dar itself, I have come to believe that they would be very valuable indeed. In fact, the Dar includes files on the constitutional committees in which Ali Mahir participated in 1923 and in 1953-54, as well as files on the principal political parties of the inter-war period, files on the Royal Cabinet which Ali Mahir headed between 1937 and 1939, and, finally, files from the Public Security Department of the Ministry of the Interior which have, particularly for the early 40's, much on political parties and personalities, including Ali Mahir. The files for the Royal Cabinet apparently have many personal papers of Mahir himself.

IV. Conclusions and Reflections on Future Work

It is not possible for me to offer any confident conclusions at this time. I must study and sift through the material I have gathered this summer, and this material will undoubtably have to be re-read in the light of further research in the documents of the British and American foreign offices and, God willing, the documents of the Dar al-Wathaiq if I can get to see them by next year. Nevertheless, I might share some reflections on the two areas into which I have divided my overall study.

In respect to Mahir's foreign policy, and, more particularly, his policies toward the Arab and Islamic worlds, I must say that my initial impressions, formed when I was working on my dissertation, have been generally confirmed. I may be surprised by what I find in the Dar al-Wathaiq and elsewhere but I feel, at least at this time, that no discoveries are likely to change, substantially, my general understanding. I might note that my views have been buttressed, in particular, by some of the works (of Abd al-Azim Ramadan, Rifat Said, and others) which I have come across for the first time during the last couple of months.

In respect to the question of Ali Mahir's concern for control of social and economic development, and of the manner in which such concern for control might be linked more generally to his domestic politics, I must confess that I remain puzzled by the immense complexity of political phenomena that do not easily lend themselves to neat categorization. Mahir has been accused of Fascism by scholars as diverse as Jacques Berque and Rifat Said, the former with hesitancy and equivocation, the latter with a bold confidence. However, if Fascism implies a revolution that seeks certain fundamental transformations in the economic and political structure of a country, then the categorization of Mahir as a Fascist remains problematic. My study of his attitude to socio-economic reforms, including his attitude during the early years of the 1952 revolution in which he opposed land reform, seems to indicate that he was not prone to use the power of the state to interfere with, or transform, the structure of the economy in any substantial manner. In respect to the more purely political domestic structure, Mahir's precise goals and hopes remain elusive. I need to devote further study to the specifics of Mahir's politics and the Egyptian context in which he operated but also to the theoretical and historical works that have sought to define, evaluate, and apply the concept of Fascism as a meaningful and fruitful historical tool. Ramadan, for example, argues that the 30's witnessed a struggle between autocratic and Fascist forces for control of the Egyptian monarchy and state. In his view, and here he appears to be breaking new ground, Ali Mahir is to be identified with the autocratic trend, while Kemal al-Bindari, supported by Misr al-Fata, and at one point engaged with Mahir in a struggle to dominate the King, is to be identified with Fascism. Ramadan's suggestions may be extremely fruitful but in order for them to be more convincing both the fundamental terms of his analysis, i.e. Fascism and "autocracy," and the specificities of the ideology and practice of the main protagonists, must be more rigorously defined and examined.

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Fellow, Summer 1985
Funded by USIA

THE GIZA PLATEAU MAPPING PROJECT: SEASON 1984-85

INTRODUCTION AND PURPOSE

The Giza Pyramids Plateau is probably the most famous archaeological site in the world. It is also one of the most thoroughly excavated sites. Excavation at Giza has produced a wealth of information in the way of architecture, artifacts, art objects, and inscriptions on the Old Kingdom, 4th Dynasty (ca. 2,600 B.C.) social context for the creation of the Giza Pyramids.

Yet, after just under 200 years of survey and archaeology at Giza, many questions about the origin of the pyramids remain mysteries. Long-standing puzzles have not been satisfactorily resolved, such as 'what kind of ramp or lifting device was used to elevate stones as high as 146 m for a pyramid like that of Khufu at Giza?' Other questions have hardly been asked, much less answered: What happened to all the material from which the ramps were formed? Assuming ramps were used, they must have been massive constructions in their own right. Where do the principle local quarries lie in relation to the pyramids and their associated cemeteries? How were non-local materials, such as 50-ton granite blocks for roofing the burial chamber in the Great Pyramid, brought into the construction site and delivered up to the pyramid? Where are the human refuse and remains of accomodations for what must have been thousands, if not tens of thousands, of workmen settled at Giza over the three generations which saw the building of the three large pyramids? What can that refuse tell us about the population size, diet, economy, of the pyramid workforce and the climate and ecology of this period?

Some of these issues have not been addressed during previous excavation at Giza because of a middle range scale of focus on pyramids, tombs, and temples. Missed were small scale features which carry important bits of information, for example, the rock cut holes and other markings around the bases of the pyramids; these are possibly indicators of the ancient survey methods. More important, the larger scale geomorphological context of the pyramids was not examined for the constraints and the opportunities the site offered to the ancient builders.

Answers to questions like those mentioned above require a recognition of the overall spatial patterning not only of the pyramids, tombs, and temples at Giza, but also things like construction debris, quarry locations, and settlement remains. The spatial organization of the site must be related to the shape and characteristics of the landforms which host the pyramids. That "landforms and depositional enviroments should be evaluated in terms of their potential contributions and relationships to site-forming processes..." (Hassan 1985, 85) has been recognized for some time in archaeological studies. Perhaps just because

archaeology advanced from an initial fascination with towering monuments to subtler forms of data retrieval from more fragile cultural remains, many of the basic techniques for describing enviromental and cultural context have not been applied to sites like the Giza Pyramids. For this purpose, a new archaeological map of the Giza Necropolis is required.

With the map as a research tool, geomorphological features may be identified as opportunities and constraints for the work layout during the construction of the pyramids and the development of their associated cemeteries. Geological analysis, using lithological and paleontological criteria, can trace stones of the individual monuments back to their source in particular beds of local rock formations. Sedimentological analysis provides distinctions among quarry debris, the same debris after use in construction ramps, settlement refuse, and origin of clays and gypsum. Cemetery plans can be coded for chronological development. Common sense offers guidelines; for example, the massive pyramid construction ramps must have proceded from the main access to the construction site, and from the major local quarry, to the pyramid. This must have been an important determinant to the spatial development of the pyramid complex, the cemeteries, and associated settlements.

In spite of a considerable amount of professional and popular attention, a contextual approach (Butzer 1982) has not been applied to the Giza Plateau. The answers to particular questions raised by this approach are not only satisfying in their own right. As components of a better understanding of the "apparatus created through the building of the early pyramids" (Kemp 1983, 89) they contribute to a wider theoretical understanding of the development of the Egyptian state and culture.

This contextual approach to the site of the Giza Pyramids motivates the Giza Plateau Mapping Project. The project will provide a survey network and a detailed 1:500 topographical and archaeological map of the Giza Necropolis. Important features of the pyramids and auxiliary architectural features which have been missed in previous archaeology at Giza will be mapped at larger scales. The survey of the topographic map is the first phase of research which will eventually include excavation focused on the anthropology of pyramid construction.

Aside from being essential for a new look, with new data, at how the Giza Pyramids site developed, the Giza Plateau Map is a valuable aim in itself for the documentation of these architectural treasures, for conservation, and for the development of the site for tourism.

The following report deals with progress made during the first, 1984-85 season of the Giza Plateau Mapping Project.

PREVIOUS EXCAVATION AND MAPPING AT THE GIZA PLATEAU

The major cemeteries of the Giza Necropolis were cleared by several expeditions working mostly in the first part of this century. 19th Century excavation (detailed by Reisner 1942, 21-2) focused mainly on the pyramids and Sphinx.

The Western Cemetery of the Great Pyramid was excavated by Junker (1929-55), Reisner (1942), Fisher (1924), Steindorf (see Porter, Moss, and Malek 1974, 108-18), Schiaparelli (whose concession for the northern part of the field was transferred to Reisner in 1905), and Abu Bakr (1953). The Eastern Cemetery was mostly excavated by Reisner (1942); the Service des Antiquités cleared some of the rock-cut tombs (Fakhry 1935). The Sphinx area was cleared by Baraize from 1923 until 1936. This work was left unpublished, although Hassan (1953) devoted a volume to the Sphinx after he continued the excavations to the N and E. Hassan also excavated the major part of the Central Field cemeteries to the E-SE of the Khafre Pyramid (Hassan 1932-60) and ended his work at Giza by clearing the area at the E base of the Great Pyramid. The temples of the Khafre Pyramid were cleared by Mariette (1882 - Valley Temple), and Hölscher (1912). The temples of the Men-kau-re Pyramid were excavated by Reisner (1931). The Archaic tombs in the South Field were excavated by Covington (1905) and Petrie (1907) who also cursorily published a poorly known Old Kingdom cemetery in the E-facing ridge of this area (Ibid.). The Saite and later tombs in the far S of the South Field were excavated by Petrie (Ibid.) and Abu Bakr for the Service des Antiquités (Porter, Moss, and Malek 1974, 296-8).

Since these major operations at Giza, smaller excavations have been carried out by Abdel Azziz-Saleh (1974) for Cairo Universty in the quarry cemetery SE of the Men-kau-re Pyramid and in the southern wadi where an industrial settlement likely of the pyramid-building period was cleared. Kromer (1978) excavated into a 4th Dynasty settlement dump on the west slope of the high knoll S of the Sphinx. Zahi Hawass excavated for the Egyptian Antiquities Organization in the area E and NE of the Sphinx from 1978 to 1980. Documentation of the architecture, relief scenes, and inscriptions in the mastabas of the Eastern and Western Cemeteries has been carried out by the Pennsylvania-Yale Expedition to Giza under William Kelly Simpson (Dunham and Simpson 1974; Simpson 1976; 1978; 1980).

The maps of the cemeteries or excavation areas produced by the previous expeditions have never been tied together in a topographic map detailed enough for archaeological analysis of the pyramids in their architectural and geomorphological context. The general maps of Giza produced by the French Expedition of 1798, published in the monumental Description de l'Égypte (1822) and those produced in the 19th Century by Perring (1839, reproduced in Vyse 1840) and by Lepsius (1849) are largely

correct for the positions of the pyramids and auxiliary structures. In these early cartographic efforts there is handsome impressionistic rendering of the topographical relief, showing some of the major landforms which were critical determinants to the development of the site. However these maps are at very small scales, and many of the architectural elements associated with the pyramids were yet to be exposed by excavation. These early maps are valuable references for the plateau and nearby valley before they were encumbered with modern structures.

The positions of the pyramids at Giza were carefully triangulated by Petrie (1883), but this map was published at a very small scale. The Survey of Egypt provides maps at scales 1:25,000 and 1:100,000 but these are far too small for archaeological study. Recently, 1:5,000 photogrammetric maps which include the Giza Pyramids have been produced for the Ministry of Housing and Reconstruction and are available through the Egyptian Survey Office. In this series the relief is accurately contoured and the scale is useful for studying the layout of the major complexes in relation to the topography. While this map series is a real boon for archaeological study, the scale is too small for some aspects of research. Only those features which could be captured in the aerial photography from which the map sheets were compiled are shown, and the plotting was not done with an eye to the archaeology of the site.

A large scale archaeological map of the Giza Pyramids is required for a better understanding of the pyramids within their context.

OBJECTIVES

The main objective of the survey phase of the Project is the production of a topographic map which identifies the major landforms and geological formations, architectural features, quarries, and cultural deposits. This phase of the Project includes the following goals:

1) The establishment of a survey control network over the Giza Necropolis.

2) A detailed 1:500 contoured map which ties together the plans of the major pyramids, temples, and cemeteries with the topography of the site.

3) Larger scale architectural studies of some of the poorly documented structures in the necropolis.

4) Geological study of the limestone formations in the pyramids area and the quarried stone forming the pyramids, tombs, and temples at Giza, to determine the source of the stone and the sequence of quarrying and construction.

5) Documentation of rock-cut features left in the floors of the courts around the Khufu and Khafre Pyramids for the analysis of how they may have been used in the layout and orientation of these pyramids.

6) Sedimentological study and spatial analysis to determine those deposits resulting from quarrying, masonry, construction ramps, and settlement; and to clarify the patterning of areas of various activities.

PROGRESS

The first season of the Giza Plateau Mapping Project began on November 1, 1984 and continued until January 17, 1985. The team consisted of Mark Lehner, A.R.C.E., Field Director; David Goodman, California Department of Transportation, Office of Geometronics, Chief Surveyor; and Ulrich Kapp, German Archaeological Institute in Cairo, photogrammeter. We were greatly assisted in the field by Ms. Amal Marcos, Inspector for the Egyptian Antiquities Organization.

The primary objective for the first season was to establish and measure a survey network over the entire Giza Necropolis. The survey methods and standards were set by David Goodman, who was greatly responsible for the success of the limited first season, not only with his expertise, but also by securing equipment. Just as valuable were David's charm and good humor.

During the season, points were set forming a main traverse, circumventing the Giza Necropolis (Fig. 3). The traverse ran over both the Mokkatam Formation, the pyramids plateau proper, and the Maadi Formation to the south of the pyramids. Subsidiary points were set in the areas of major architectural interest, for geological mapping, and for mapping the main quarries. One goal is to calculate volumes of stone which were exploited. While the main traverse was completed, not all of the subsidiary traverse points were measured this season.

On the eve of a new year, December 31, 1984, Goodman and Lehner braved the cold of the plateau at the north flank of the Great Pyramid to observe the circumpolar star, Polaris. This allowed for azimuth control of the traverse and the establishment of a grid with major lines corresponding to the center axes of the Great Pyramid (Fig. 4).

The base of the Great Pyramid was surveyed for the length of the sides, corner angles, and orientation. Our closed loop traverse around the four siders of the pyramid was through the brass survey plugs set by Petrie (1883, Pl. VI) near the corners of the four "sockets" at the four corners of the pyramid. When the SW socket (see Maragioglio and Rinaldi 1965, 12-15) was cleared, a hole, 4 cm square, was found at the expected location of the plug but the plug itself was missing. In its place, we set in epoxy a

17 mm galvanized nail stamped with the letters "PK". From the traverse lines on the four sides of the pyramid, we took 79 "fallings", or offset measures, to base of the casing on the foundation platform, and the top and bottom of the platform itself.

To check the accuracy of leveling at the base, something long acclaimed for this pyramid, 294 readings, or spot heights, were taken around the base on the natural rock socle, the foundation platform, and the top of the first course of stones.

The results of our survey of the Khufu pyramid will be reported elsewhere, after we "tie in" the two survey markers affixed in the platform at the top of the pyramid. It might be mentioned now that out of about 921.441 m of the original casing baseline (Dorner 1981, 77), only about 54.44 m actually remains, and some of this, on the W side, is badly worn. Of the original upper and lower edges, or the face, of the foundation platform, about 212.48 m remain. On these lines the survey of the original size and orientation of the pyramid must be based.

During December, when Goodman was in Luxor with the Berkeley Theban Mapping Project, Lehner continued at the Second (Khafre) Pyramid court. One aim was to test the hypothesis that series of lines of small rock-cut holes at regular spacings around the base of the pyramid were cut to hold stakes to carry a level reference line during the construction of the pyramid base (Lehner 1983). The holes were checked for alignment, and for the accuracy of the 90 degree corners formed by extrapolating the lines with a theodolite from the four sides. The area of the NW corner of the pyramid court was cleared of accumulated sand and debris in order to draw a detailed plan of these holes and other rock-cut features in the floor at the base of the pyramid (Figs. 6-10).

The survey of the main traverse continued for 10 days in January when Goodman returned to the project. During the final week of the season, Ulrich Kapp began a terrestial photogrammetric study of the pyramids plateau. The photogrammetry makes possible scale elevations of the Giza panorama. This season, the survey included photography for projections of the plateau from various points to the S and E of the plateau.

MAIN TRAVERSE

The first station of the main traverse was set by a point on top of the prominent knoll of the Maadi Formation overlooking the wide central wadi S of the Sphinx (Fig. 1). This makes an ideal survey triangulation station, and offers a magnificent visual survey of the entire pyramids plateau; the Mokkatam Formation, on which the pyramids rest, slopes from the NW to the SE at 3 to 6 degrees down to the wadi at the base of the knoll.
This point, like the other 10 main traverse stations, was designated "GP" (Giza Plateau) 1. The traverse circumvents

the parts of the Giza Necropolis on both the Maadi and Mokkatam Formations as illustrated in Fig. 3. Auxiliary stations were given letter codes indicative of the area of the site, e.g. GEF1 (Giza, Eastern Field), GCF1 (Giza, Central Field).

David Goodman's report on the methods and standards of the survey follows.

1984/85 Season: Control Surveys
David Goodman

In the 1984/85 inaugural season of the GPMP, basic horizontal survey control was established in an eleven-course traverse around the necropolis (Fig. 3). Generally, this traverse skirted the major ancient features of the plateau. Where this was not possible, auxiliary stations were established outside the basic control traverse. In addition, supplemental stations were set at or near every major aspect or feature of the necropolis.

Most stations were physically established by drilling 3/4" holes in stable bedrock and epoxying mushroom-shaped 3 1/2" aluminum survey disks with 5/8" corrugated stems into the holes and onto the rock (Fig. 2). These disks were manufactured especially for the Project, and each bears the Project name in itaglio relief. Into each disk a discrete station point was center-punched and the date of setting and the station name were inscribed with punch dyes. Where the bedrock was too hard for drilling, cross-marks were scribed into the rock with a tungsten carbide scriber. At all stations - basic, auxiliary, and supplemental - two or more "witness" or "reference" marks were scribed into the rock as locators and to insure the permanence of the stations.

Through the courtesy of Lietz/Sokkisha Co. of Overland Park, Kansas, second-order surveying equipment was loaned, without any cost to the Project, for this first season. The new equipment loaned by Lietz included a one-second theodolite, a RED2A infrared electronic distance measurer (EDM) with liquid crystal display (Fig. 1) and a B2C engineer's precise pendulum level.

The TM1A theodolite has these specifications:

1. Plate level sensitivity - 20"/2mm,
2. Horizontal and Vertical Circle Readings - micrometer reading direct to one-second of arc, and
3. Telescope - magnification of 30 power and resolving power of 2.5 seconds of arc.

The RED2A is "spec'd" at a linear measurement accuracy of $\pm$ (5mm $\pm$ 5ppm) mean square error. The B2C precise level has a standard deviation of $\pm$ 1.0mm for a double-run line that is one kilometer long.

Each of the eleven stations of the basic control traverse was "occupied" by the theodolite and the EDM for measurements of

slope distances between contiguous stations and of direction lines between the stations. The distance of each course (one station to another) was measured forward and back. Each slope measurement was a temperature- and pressure-corrected mean of ten independent measuring observations by the RED2A. The corrected slope distances were trigonometrically resolved into horizontal values. This was done through the use of zenith angles that were observed at each station.

Second order, modified, observing procedures were used for the measurement of directions and zenith angles with the TM1A. These procedures included:

1. The shielding of the theodolite from the sun's rays by the use of a large umbrella;

2. The observing of four sets of directions with the circle set at a different initial value for each set (one set is comprised of a reading with the telescope in the direct mode and another reading with the telescope inverted) for each direction determined;

3. The rejection (and reobserving) of each set of direct and inverted observations whose average differed more than five seconds from the mean of all four sets; and

4. The use of the "forced centering" technique, whereby the accuracy of the theodolite/EDM setups were exactly the same of those of the target/reflectors. In addition, the tribrachs, which support the theodolite and the targets on the tripods, were checked weekly and their optical plummets were adjusted to $\pm$ 1mm accuracy.

Azimuth control for the GPMP was established by observing the north circumpolar star "Polaris". Eight sets of direct and reverse sightings were observed on Polaris on the evening of December 31, 1984. The theodolite occupied the traverse station GP10 (Fig. 3) and the angle from Polaris to traverse station GP9 was measured. The azimuth thus determined of course GP10-9 is calculated to be within $\pm$ five seconds of a true value.

The 6,000 meter + GPMP basic control traverse began and ended in a closed-loop at traverse station GP1. Azimuth closure error was nil! Thus, adjustment of the "raw" azimuths was not required. Using these raw azimuths with corresponding measured course distances, a closure accuracy of one part in 315,000 was realized. This closure was considerably better than the accuracy that was sought, and it assures a precise horizontal control matrix for all subsequent GPMP surveying and mapping objectives.

The established horizontal control matrix, to be termed the "GPMP GRID" (Fig. 4), is astronomically oriented (from the Polaris observations). Coordinate values of the GPMP GRID are based on a

calculated horizontal center of the base of the Great Pyramid of Khufu. This calculated center was assigned coordinates of North 100,000 meters and East 500,000 meters. The center of the Pyramid was calculated from a closed loop traverse, during the '84/'85 season, through the brass survey plugs that were recovered in the "sockets" at the Pyramid's corners.

Two record survey monuments are documented as existing atop the Great Pyramid. One monument bears first-order and the other second-order geographic positions (expressed in latitude and longitude). The first-order monument is a copper geodetic marker fixed with mortar in the SW corner of the square top of the Pyramid. The second-order monument, 2.3 meters NE of the copper marker, is the prominent wooden pole at the center of the top. In the next GPMP season these two monuments will be "tied" into the basic control traverse, and their grid coordinates will be calculated.

During the traversing of this first season, differences in elevations, delta E's, of stations on each and all of the courses were trigonometrically calculated from corrected slope distance and zenith angle measurements. Because each course was measured twice, from its opposite ends, dual calculations of all delta E's were possible. On most courses the dual delta E's agreed within $\pm$ centimeter. At the time of the traversing a bench mark (of unknown elevation) of the Survey of Egypt was found in the N face of the First Pyramid, within a few meters of the NE corner. This was the only bench mark that was recovered in the Giza Plateau and its environs. Since its elevation was unknown at the time of our field work, all the stations traversed were not given calculated trigonometric elevations. The elevation of this bench mark was later found in the "Descriptions of Elevations of Survey Bench Marks: The Provinces of al-Jizah and Beni Suef," Survey Department of Egypt (Ministry of Finance, Cairo 1936), p. 18 as 61.724 above sea level.

In subsequent seasons of GPMP field surveying, differential levels will be run through all possible traverse points. All of the leveling "loops" will be "tied" directly to the Great Pyramid bench mark. The sea level elevations thus established will be used with calculated trigonometric delta E's to establish accurate elevations on all GPMP control stations. With the completion of leveling, the GPMP control matrix of X, Y, and Z values will have been established. This matrix will be the foundation for all following field surveying and mapping and for photogrammetric mapping, studies, and quantity calculations.

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KHAFRE PYRAMID SURVEY

Rock-cut Features in the Pyramid Court

In a report in the Journal of the American Research Center in Egypt (Lehner 1983) it was suggested that holes forming lines parallel to the sides of the Khufu and Khafre Pyramids were cut for stakes to carry an accurate reference line for determining the pyramid base as it was being construction. A goal this season was to check the alignment of these holes as well as the accuracy of the roughly 90 degree corners they would be expected to form at the corners of the square they describe. If the holes indicate a builders' reference line, they should all be situated on a straight line the length of the sides of the pyramid court. The orientation and 90 degree corners of the line which the holes form around the pyramid base should, further, allow for an accuracy equal to that of the orientation and corner angles of the pyramid base.

The JARCE report stated that there are three lines of holes parallel to each side of the Khafre Pyramid. The holes of each line range from 30 to 40 cm in diameter. The outer two lines run alongside the raised rock-cut edge marking the outside limit of the enclosure wall about 13.5 m from the pyramid base. Nothing is left of the wall itself. The holes of these two lines are close together, albeit staggered slightly in their spacing (Ibid., 23, Fig. 1, 24, Fig. 2A-B). The holes closest to the wall-line were given letter and number designations according to the side of the pyramid and their numerical sequence, e.g. N1, N2 ("north" 1, 2 etc.). The holes of the series just alongside this line were given the same letter designation with the letter "A" added, e.g. N1A, N2A, etc. (see Fig. 10). The holes of the third and inner line were given similar designations with the letter B, e.g. W2B ("west" 2B). The inner series runs along the inside (or court side) line of the enclosure wall, which is at the outside of the dip or trough in the floor of the court. The dip is most prominent at the corners (Ibid., 11-12). It was reported that the B-series on the N, S, and W sides of the pyramid are not as consistent in their spacing and occurence as the series along the outside of the enclosure wall bed.

During this season, when the NW corner of the Khafre Pyramid court was cleaned, a more irregular series of smaller holes was noted along the W end of the N side of the pyramid base (Figs. 9, 10). These were given C-numbers, e.g. N1C, N2C, etc.

The patterning of holes varies on the E from the other three sides of the pyramid court. Here the two more consistent and closely spaced series run 9.1 and 9.9 m from the pyramid base (designated series EB and E respectively). Like the two outermost lines on the N, S, and W sides, the individual E and EB holes are close beside one another, but their spacing with

respect to one another is staggered. On the E, the outside line of the enclosure wall bed runs under the W wall of the Mortuary Temple. The rock edge marking the wall-line is quite rough, and though holes occur alongside it, neither their spacing nor occurence are consistent.

It was suggested that the E and/or EB series of holes was the final master orientation line for the Khafre Pyramid (Ibid., 19-20). The hypothesis was that the N, S and W series immediately along the outside of the enclosure wall bed were the final reference lines for those sides.

A question in this reconstruction of the use of the holes is why the final reference line would have been one of those 9.1 or 9.9 m from the pyramid base on the E, and the one 13.5 m from the pyramid base on the N, S, and W. Was the final reference line moved closer to the pyramid on the E because the Mortuary Temple was already under construction while the line was yet in use?

The marks were more thoroughly examined this season. A troubling fact for the hypothesis sketched above is that no holes exist at what should be the NE and SE corners formed by extrapolating the lines of holes (E and EB) on the E to cross the double lines of holes on the N and S (N, NA and S, SA). This is contrary to the schematic diagram in the JARCE report (Ibid., 23, Fig. 1). Likewise, there are no holes at the very outer NE and SE corners of the enclosure wall bed. There seems to have been no provision for markers at what would have been the NE and SE corners of the square implied by the lines of holes. It should be noted, however, that the rock surface just outside the outer NE and SE corners of the enclosure wall bed is fairly irregular and badly worn - presumably by visitor traffic.

Practically the entire SW corner of the Khafre court is covered by debris, including unexcavated deposit up to a meter deep at the SW corner of the enclosure wall bed. The NW corner of the court had been mostly cleared by the time of our 1984 season, but a thin pile of debris covered the outer corner of the court where the NW corner of the enclosure wall bed is located, and where the outer two lines of holes would meet.

When the NW corner debris was cleared, the rock surface at the intersection of the hole-series N-NA and W-WA (Figs. 9, 10) appeared to have suffered little damage since ancient times. The surface was very rough and unfinished in this small area at the outside corner of the enclosure wall bed (Fig. 6, lower left). In spite of this, there is a hole (labelled "NW" in Fig. 10) marking the intersection of hole-lines N and W. There are also holes of the N and W lines spaced only 1 m from the corner hole, NW. These were labelled N0 ("north zero") and W0 respectively (Fig. 10).

There is no hole marking the intersection of the outermost

series, NA and WA, nor was there a hole in the NA series corresponding to NO. There is the faint indication of a "zero" hole for the WA series, labelled "WOA" in Fig. 10. From NO and WO the holes are spaced generally about 5.3 m apart down the line. A general range of spacing is from 5.06 to 5.69 m. Ten royal cubits seems to have been approximated in the spacing, though toward the E end of line N there are a few irregularly spaced holes, and smaller holes on-line close beside the evenly spaced holes in the series.

The corner hole, "NW", is fairly shallow with rough edges (Fig 10). Hole WO was also very shallow and hole WOA was only the residue of a hole in the form of a round dish-shaped depression. These conditions, plus the rough and unfinished character of the rock surface at this corner, suggests that the holes here were for preliminary layout work. Holes NW, WO, and WOA may have once been deeper, having been cut when the rock surface was higher, as indicated in Fig. 2C in the JARCE report (Ibid., 24). Once the corner holes (for stakes) of the outermost A-line had been established, the surface was further cut down, leaving hole WOA very shallow, and perhaps obliterating entirely the missing corner hole, NWA, as well as the missing NOA. The step was repeated for the stage represented by holes NO, WO, and the corner hole NW. Still later, it seems the corner became less important and the surface just at the corner was left rough and undressed.

Does this indicate that, contrary to the reconstructed sequence in the JARCE report, the B-series of holes along the inner line of the enclosure wall were the last-stage reference line for the final determination of the pyramid base on the N, S, and W as lines E, EB were on the E side? The problem is that in our research so far, the inner B-series has not been as clearly delineated on the N, S, and W sides of the Khafre court it is on the E.

The characteristics of the rock surface and the features exposed at the NW corner of the Khafre court, at any rate, support the hypothesis that the various lines of holes are reference lines for various stages in a succesive approximation of the pyramid base.

Testing the Accuracy of the Hole-lines

The accuracy of the alignment, orientation, and corner angles of the hole-lines were tested in the following way:

1. A scribed cross was set at the E side of hole NO (Fig. 10) on line with the axis of the hole.

2. A scribed cross was set at the W side of hole N44, on line with the axis of the hole. N44 is about 242 m down-line to the E from NO. N44 is .75 m W of the prominent rock-cut trench off the

NE corner of the pyramid. It was the furthest hole to the E of the N-series. Two other smaller holes flank the trench to either side of it, but they do not appear to be of the N-series. Generally, the intention seems to have been to have 44 spacings between holes on the four sides of the court in these series. The 22nd hole in the N, S, E, and W series appear to be close to an alignment with the center axis of the pyramid, though this was not measured this season. In the N-series, where holes N18 and N29 should be, there are large fissures. Also, some irregularities occur in the N-series around N36 to N39 with smaller holes close together and variant spacings between the groups of holes thus formed.

3. A theodolite was set up on the point by N44 and a sighting was taken to a target over the scribed point by NO. A stadia rod was positioned att the center of each hole in the N-series, none of which deviated significantly from line N44-NO. With the theodolite, points were set on line N44-NO beside holes N33, N22, and N11.

The technique was the same at all four corners of the court for establishing the extrapolated intersections of the hole-lines of the four sides. This will be illustrated for the NW corner.

4. The theodolite was set up on the line N44-NO point scribed beside hole N11, about 62 to 63 m down-line from hole NO. The vertical hair of the telescope was aligned to the target on the scribed point beside hole NO.

5. Line N11-NO was "prodded" W beyond the point by NO. Two points, NWx1 and NWx2 were scribed with "X's" at a spacing which would allow for an intersection with a line "prod" from the W-series of holes (see Fig. 10).

6. A scribed cross was set at the S edge of hole W1 on line with the axis of the hole (hole WO, actually the first on the N in the W-series, was too shallow and irregular for a good alignment with its axis).

7. Since debris covers much of the SW corner of the Khafre court, the furthest hole we found in the W-series to the S was some distance N of the SW corner of the court. Also, some of the holes of the W-series were not seen, because of a great deal of debris and pieces of granite casing which remain to be cleared from the court. The furthest hole to the S which we located should be hole number 40 in the series, if the spacing is regular. This hole was designated W40. A scribed cross was set at the northern edge of W40, on line with its axis.

8. The theodolite was set up on the scribed point beside W40. The vertical cross hair of the telescope was fixed to a target over the scribed point beside W1. Points on line W40-W1 were scribed beside holes W30 and W19.

9. The theodolite was set up on the point scribed beside hole W19, some 99 m S of W1. The vertical cross-hair of the telescope was fixed to the point beside W1 and line W19-W1 was "prodded" N of W1.

10. Points NWx3 and NWx4 were scribed on this line so that the line "prod" of the W-series of holes would intersect the line "prod", NWx1-NWx2 of the N-series of holes (see Fig. 10).

11. The intersection of line "prods" NWx1-NWx2 and NWx3-NWx4 was found by stretching string along both "prods". The intersection was marked by a galvanized 17mm nail with "PK" on the head. The nail was set with epoxy in a drilled hole. As the nail was set, the point was checked by theodolites set up on the line-points by holes N11 and W19. The point of intersection falls within hole NW as marked by the small circle in Fig. 10,

The same procedure of "prodding" the lines established for the series of holes and finding the intersections was followed for the other three corners. On the E side of the pyramid a choice was made between the two lines at 9.1 and 9.9 m from the pyramid base. Given time limitations, both lines could not be surveyed this season. The line 9.9 m from the pyramid base appeared to be more accurately aligned and consistently spaced on the basis of a visual inspection and by stretching a 50 m tape over the axis of series of 9 or 10 holes in each line. The 9.9 m line, called the E-series, was "prodded" at its N and S ends to intersect with "prods" of the S-series and N-series along the outside line of the enclsoure wall. The intersection points were marked with 17mm "PK" nails set in epoxy.

Again, it is interesting that, unlike hole "NW" at the NW corner (Fig. 10), no holes marked the intersection that was obtained on the NE and SE. However, close to the NE intersection of the E-series and N-series there are some lines etched in the edge of the rock bedding of the enclosure wall (Fig. 5). These lines are slightly SW of our intersection point. It is also significant that no holes of the N- and S-series were found further E on those lines than the intersections we obtained for these lines and the E-series. This might indicate that the N-, S-, and W-series close beside the outer line of the enclosure wall did form, with the E- or EB-series, the final reference square.

At the SW corner there is a modern excavation trench cut through the debris which covers the SW corner of the court. The trench appears to have been cut to locate the outer corner of the court. The trench had been partially refilled with debris; we were allowed to clear out a small patch of rock floor at the deep end of the trench where the outer corner of the bed of the enclosure wall is located. While this did not allow a clear look at the corner, we were able to find the intersection of our line "prods"

of the S- and W-series of holes by plumbing down into the trench. The point of intersection was marked with a 17mm "PK" nail set in epoxy. Measuring the angle of this intersection with the theodolite set up over the point at the bottom of the debris-filled trench proved to be no small task!

The four corner points established by the intersection of the series of holes selected at the four sides of the Khafre court were designated GII (Second Giza Pyramid) as follows: GII3, NE corner; GII4, SE corner; GII5, SW corner; GII6, NW corner. The horizontal angles between these points were measured with the Lietz-Sokkisha TM1A one-second theodolite and the distances between the points were measured with the RED2A distance measurer. The results are as follows:

Side	Line	Distance	Azimuth	Deviation
N	GII6-GII3	238.738	89° 55'32"	4'28"
S	GII4-GII5	238.671	89° 57'33"	2'27"
E	GII3-GII4	243.009	359° 54'45"	5'15"
W	GII5-GII6	242.864	359° 53'53"	6' 7"

Corner		Angle	Deviation
NE	GII4-3-6	90° 00'47"	0'47"
SE	GII3-4-5	89° 57'12"	2'48"
SW	GII4-5-6	90° 03'41"	3'41"
NW	GII5-6-3	89° 58'21"	1'39"

For comparison, the corner angles and azimuths of the sides of the Khafre Pyramid, on the basis of the most recent survey by J. Dorner (1981), are as follows:

Side	Azimuth	Deviation	Deviation from Hole-line
N	89° 54'50"	-5'10"	0'42"
S	89° 54'20"	-5'40"	3'13"
E	359° 54'00"	-6'00"	0'45"
W	359° 54'00"	-6'00"	0'07"
Average		-5'43"	1'12"

Corner	Angle	Deviation from hole-lines
NE	90° 00'50"	0'03"
SE	89° 59'40"	2'28"
SW	90° 00'20"	3'21"
NW	89° 59'40"	1'19"
Average		1'48"

The azimuths, except on the W, are slightly better for the hole-lines than for the sides of the pyramid according to these measurements. At the same time these results indicate that the interior corner angles are better on the pyramid than at the

intersections of the hole-lines. These results will be checked next season. It should be stated that the closure error on our traverse through points GII1-6 was 7 mm for a closure accuracy of 1 part in 139,600.

The NW Corner of the Khafre Court: Notes and Observations on the Plan

The features around the Khafre court are a challenge for scale graphic rendering. The sides of the court are about 242 m long and the system of features include holes from 10 to 30 cm in diameter. It was decided to do 1:50 detailed plans of the corners of the pyramid and court, and possibly the areas of the center axes, to capture the patterning of the features. This season a 1:50 plan of the NW corner of the court was begun.

This corner presents a good opportunity for studying the ancient techniques of pyramid layout. The original limestone surface was cut down to a depth of about 10.5 m to make a level terrace around the pyramid, leaving natural rock protruding in the NW core of the pyramid (Ibid., 7; see Maragioglio and Rinaldi 1966, Tv. 6; and Figs. 11-G-G' and 12 here). The first layout work would have been started on the upper surface, 10.5 m higher than the pyramid base. This season, small holes were located at certain intervals along the edge of the upper ledge on the W. These have yet to be mapped. The width of the terrace off the NW corner of the Khafre Pyramid is 57.30 m on the N, measured from the pyramid baseline, and 27.60 on the W. Along the N side of the terrace there is the long-known gridded quarry (Fig. 12) - squares of natural rock defined by a grid of channels. The major stages of laying out and working the surface to prepare a large pyramid have left traces in this area. Eventually, the corner of the entire terrace will be mapped to document these stages.

The features within the pyramid court itself must represent the final stages of reference lines and the leveling of the pyramid base. Fig. 9 shows all the evidence which could be captured at scale 1:50. The corner of the bedrock core massif of the pyramid is in the lower left corner of the drawing; the outer corner of the court and the bed of the enclosure wall are at the upper right. For elevations, point GII6 (see above), set with a "PK" nail in the corner hole, "NW", was chosen as a zero datum. Elevations are expressed in meters above (+) or below (-) this datum.

All the major fissures are drawn in Fig. 9. Three large fissures cut through the court in a NW-SE direction. The middle of these fissures passes through the point where the NW corner of the pyramid was formed of granite casing (Fig. 7). Most of the fissures appear to have been filled in with gypsum mortar before the enclosure wall was built and the pavement slabs were laid down between the wall and the pyramid base. The rectilinear lines on the court and the bed of the enclosure wall trace the

positions of individual pavement or wall- foundation slabs. Individual "seats" or emplacements were prepared for each slab. Several pavement and wall- foundation slabs remain *in situ* to either side of the trench which spans the width of the N enclosure wall bed.

The staggered W,WA and N,NA lines of holes are shown along the outside line of the enclosure wall bed. On the W side, the inner B-series of holes is prominent. None of the NB-series, along the inside line of the enclosure wall, are shown in the area covered by Fig. 9.

The prominent rock-cut trench is shown in Fig. 9. Trenches like this also exist at the NE, SE, and probably at the SW corners of the court (Lehner 1983, 9, 23, Fig. 1). This trench was cleaned out during our season (Fig. 8). The main part of the trench is 6 m long, 1 to 1.0 m wide, and .90 m deep (see Figs. 9 and 11, profile A-A'). A large fissure, .50 to .75 m wide, cuts through the main part of the trench, from its NW corner to the middle of its E side. The fissure was doubtless once filled in and the E side of the trench would have been formed across the fill. Along the E edge of the fissure, there are rectangular-shaped cuttings which may have been left from prying up stone blocks along the course of the fissure.

At the upper W edge of the main part of the trench there are two small square cuttings each about .30 m long, .12 to .16 m wide, and .12 m deep. These notches are located about 1.40 and 4.15 m from the S end of the trench. These appear to be sockets. Almost directly across from the S-most of these two notches, there is a matching cut on the upper E edge of the trench (Fig. 9, see also Fig. 10). There may also have been a notch on the E edge of the trench matching that on the W edge closer to the N end of the trench, if the E side of the trench was formed across a fill of the large fissure, which seems probable.

In the floor at the center S end of the trench there is a small square hole, .34 m wide (Fig. 8). The hole is filled with limestone chips and gypsum mortar which also partially covers the floor at this end of the trench. As mentioned, the main part of the trench spans the width of the enclosure wall bed. This hole would nearly align to the NB series of holes along the inside line of the enclosure wall, which are first exposed further E than the view in Fig. 9.

As described in the JARCE report (Lehner 1983, 10), there is a shallower but broader extension of the trench at its S end facing into the court. This consists of three adjoined panel-like cuttings. The extension meets the E and W sides of the main part of the trench at right angles (Fig. 9) forming a step down to the bottom of the deeper floor of the trench (Figs. 9, 11, profile E-E'). The S end of the extension is about on line with the diagonal of the pyramid (Fig. 10). Fig. 11, A-A' to F-F'

presents the trench and its immediate context in profile.

In the final two days of fieldwork, surface cleaning revealed a shallow depression, .69 to .50 m wide, and 7.08 m long, extending from the N end of the trench. This appears to be a shallow drain (Figs. 9, 10).

At the NW corner of the pyramid itself, the top of the first step, cut in the natural rock, marks the height of the missing first course of granite casing. This surface is remarklably level to the extent that we measured it this season (Fig. 9; see Maragioglio and Rinaldi 1966, 100). From this surface there is a .88 m drop to a narrow step on the far N end of the W side. This step drops, in turn, .48 m to the slightly raised rock socle, or bed, on which the casing rested around the Khafre pyramid base (see Petrie 1883, 33; Maragioglio and Rinaldi 1966, 48). The height of the casing socle varies considerably in the emplacements for the individual granite blocks, by as much as .35 m in the small area represented by Fig. 9.

At the corner itself, there is no raised socle, rather a very level E-W rectangular bed for what must have been an enormous granite casing block forming the base NW corner of the pyramid. This bed measures 2.20 (N-S) X 4.50 m (E-W). On all four sides of this emplacement there are rectangular cuttings, ranging from .40 to .60 m long and from .24 to .50 m wide, which cut across the edge of the emplacement. These also occur at the sides of the other emplacements for the casing blocks and they are clearly sockets for large levers to adjust the positions of the blocks. Maragioglio and Rinaldi (Ibid., 48) point out that this emplacement for the NW corner block does not indicate a use of sockets as at the four corners of the Khufu Pyramid, since the raised rock socle is found at the other three corners of the Khafre Pyramid.

Just alongside the casing socle at the NW corner, on both the N and W sides, there is a panel defined by a subtle recess to the surface, .66 to .90 m wide. Close to the far N and W ends of the emplacement for the NW corner casing block there are smaller holes. About 1 m from the W baseline there is a pair of holes. Each is about .20 m in diameter. There is a series of holes of various sizes roughly parallel to the far W end of the N side, about 1.3 to 1.5 m from the baseline.

Interpretation

In Fig. 10 the fissures and the cuttings for the pavement and wall-foundation slabs have been excluded from the map of the NW corner of the Khafre court in order to clarify the principal features. The baseline of the pyramid is indicated by a dashed line. This is an approximation derived by extrapolating from the edge of the casing socle immediately to the S and E.

A dashed diagonal line has been drawn from the corner of the natural rock core massif above the first step to point GII6 in hole "NW" - the corner hole of the W- and N-series of holes. This diagonal is slightly off the corner of the reconstructed pyramid baseline, but the latter is, again, only approximated in Fig. 10. The diagonal cuts across the shallow extension of the trench, and nearly bisects two holes at the interior corner of he enclosure wall bed, NWC and NWB. The latter holes seem to function for the WB series as hole NW functioned at the outer corner for the W- and N-series. Similar to the arrangement for the outer corner, there is a hole, W1B, beginning the WB-series, only 1 m from the corner hole. The same arrangement for the N-series, or the correspondent at the interior corner to hole N0 at the exterior corner, is missing here.

It can be noted in Fig. 10 that in the outer W- and N-series, the third hole (after W0 and N0) on both lines, W3 and N3, nearly align to the sides of the bedrock core massif. At the N side hole N3A is closer to this alignment. In the WB-series, there is a cluster of 8 holes. The first of these from the N, $W2B_1$, is .44 m S of an alignment with the N side of the pyramid. W2B3 to W3B4 are near to an alignment with the N side of the pyramid's bedrock core massif. The line runs between W2B3 and W3B. Were these holes for stakes marking approximate reference points while the core massif was trimmed back?

There may have been a similar function for the holes which cluster near the actual NW corner of the pyramid casing. It would be convenient to see the small holes, W1C and W2C, for stakes marking the desired N baseline for the pyramid, which would have run between the stakes. Or we might expect holes off the corners for stakes which functioned like those in Isler's (1983) Fig. 1. These small holes, however, are too far off to the S of the N pyramid baseline for such functions (for holes off the corners of the Khufu Pyramid, see Goyon 1969, 71-77). On the N side of the corner, holes N1C and N2C fall on either side of an alignment with the W pyramid baseline. However, there are several other holes to the E along this side. More study, particularly the careful mapping of the features at the other corners of the Khafre pyramid, will help clarify the function of these marks.

In the JARCE report it was suggested that the trenches at the corners of the Khafre court were for the first approximation of a reference square which defined the area of the court (Lehner 1983, 13-14). The hole in the far S end of the trench, which falls nearly on line with the NB-series of holes, might be seen as a confirmation of step 3 in the suggested sequence of layout for the Khafre Pyramid where the "first inner layout square was projected from points in the trenches" (Ibid., 14, Fig. 2C).

This does not explain why such a deep rock cut trench was needed. Also, it is clear that the trench had another function. The

shallow drain at the N end of the trench suggests that water was to be carried away from the court after the trench was filled to a level slightly higher (about .18 m) than the bottom of the trough in the court. Maragioglio and Rinaldi (1966, 74) suggested that the trenches were for draining rain water which came down off the face of the pyramid. Again, it must be pointed out that the NW trench need not have been cut so deep, if that were the case, nor would its N end be vertical.

The fact that the trench was cut deeper than either the dip in the floor of the court or the drain at its N end suggests it was a reservoir. The beginning of the drain at the N edge of the trench is about .21 m lower than the level of the bed of the enclosure wall, while the extension at the S end of the trench is about .45 m lower than the bed of the enclosure wall (Fig. 9). If water filled the court trough and trench to within .21 m of the enclosure wall, it would have drained off from the N end of the trench. If water was meant to be brought up to the level of the enclosure wall bed, as depicted in Fig. 2C of the JARCE report (Lehner 1983, 24), a barrier could have been built across the trench to prevent the water from flowing out its N end. The notches on the upper edge of the trench (Fig. 10) may have had something to do with blocking the trench. When the blocking was removed, the water would have flowed from the court trough and trench out the drain at the N end. Of course, water would have remained in the trench to a depth of .65 m (Fig. 11, profile A-A'). This still would have left about .15 m of water in the lowest part of the court trough.

In summary, the trench may have been a reservoir into which water was poured and channeled into the trough at the corner of the court for leveling operations. If the water was brought up to the level of the enclosure wall bed, the trench may have contained a sluice gate for lowering the water level when desired.

It should be pointed out that, contrary to the schematic profile in the JARCE report (Ibid.), the enclosure wall bed and the casing socle are not at the same elevations. The socle, as mentioned, varies in the heights of the emplacements for the individual casing blocks, but ranges from .37 to .27 m above the level of the wall bed. The emplacement for the NW corner casing block, on the other hand, is about .08 m below the level of the wall bed.

Profiles Across the Larger Terrace

Two profiles were drawn from the NW corner of the Khafre Pyramid across the wide terrace to the rock-cut ledge. In Fig. 11 profile G-G' runs across the terrace from the N end of the W side of the pyramid (see Fig. 9 for the direction of the profile). It shows the relationships between the bedrock core massif in the pyramid; the court trough; the holes in the WB, W, and WA series;

the enclosure wall bed; the rock ledge; and the outer terrace. There is a pronounced dip or trough in the floor of the outer terrace between the enclosure wall bed and the ledge. Maragioglio and Rinaldi (1966, 44) suggested that this, like the trough inside the court, was for draining rain water. A recess, .50 m high and .20 m deep, is cut into the very bottom of the ledge for most of its length parallel to the W side of the pyramid court.

Profile H-H' (Fig. 13) runs from the first step of the pyramid core massif on the W side across the court and the terrace to the N. It was drawn to show the relationship of the pyramid and court with the gridded quarry beside the base of the ledge (Fig. 12). It has been suggested that the cubes of natural rock, defined by channels, represent the sizes of blocks which were extracted as the terrace was being quarried down. So far, I have not seen any wedge-shaped cuttings along the edges of the cubes, which one might expect if the blocks had been pryed off with levers. Such marks are readily seen in other quarries at Giza. The orientation of the grid is skewed W of N from the orientation of the pyramid, court, and the wider terrace.

The cubes and channels may have had more to do with the creation of the very regular slope down to the N from the outer line of the enclosure wall along the entire N side of the pyramid court. The top of the quarry grid slopes slightly to the E. Although its surface is not level, it is within 5 to 15 cm of the levels of the pyramid casing socle and bed of the enclosure wall (as measured at the NW corner only). This suggests that the top of the grid cubes and the levels of the enclosure wall bed and casing socle indicate a surface which existed before the wall-bed and socle were more finely worked, and before the court trough and outside slope were formed. The channels, defining the grid, were a way of organizing the surface to work it down to a desired plane. One wonders, were groups of workmen assigned certain numbers of cubes to be worked within a given period?

FUTURE WORK

In the second season of the Giza Plateau Mapping Project we will continue to measure the auxiliary and supplemental traverse stations. The survey of the Khufu Pyrammid will be completed. The Khafre Pyramid will be surveyed and further compared to the series of hole-lines around the court. The rock-cut features in the floor will be mapped in detail at the other corners of the Khafre court. On the basis of traverse points circumventing the major quarry areas, the volume of locally extracted stone will be compared to the volumes of the pyramids. It is hoped that arrangements will be made for aerial photography for photogrammetric mapping of the site.

ACKNOWLEDGEMENTS

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Mr. Zahi Hawass, University of Pennsylvania, has advised and assisted the Project from the beginning and we look forward to continued collaboration.

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Margaret Sears has been the U.S. Coordinator for the Project, contributing her expertise in public relations, fund raising and organizing lectures.

We are grateful to Dr. Robert Wenke and Dr. Nanette Pyne who, as Directors of the American Research Center in Egypt Cairo office, were instrumental in inaugurating the Project. We are also indebted to Prof. Kent Weeks for the loan of surveying tripods and reflectors as well as for advice, to the Lietz-Sokkisha Coporation of Overland Park, Kansas, particularly to George Huber and William Speinbrecker, for the loan of a theodolite, distance measurer, and surveyor's level, to the German Archaeological Institute in Cairo for the time of Ulrich Kapp and for the use of photogrammetric equipment and to Joseph Dorner for making available the results of his survey of the Pyramids.

The American Research Center in Egypt, particularly Dr. Mary Ellen Lane, Assistant Director for Development, for her tireless support; Dr. Paul Walker, Executive Director; and Dr. Richard Verdery, Director of the Cairo Office.

Mark Lehner
American Research Center in Egypt

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Fig. 1. David Goodman with the Lietz-Sokkisha TM1A theodolite and RED2A distance measurer at traverse point GP1 on the high knoll south of the Sphinx.

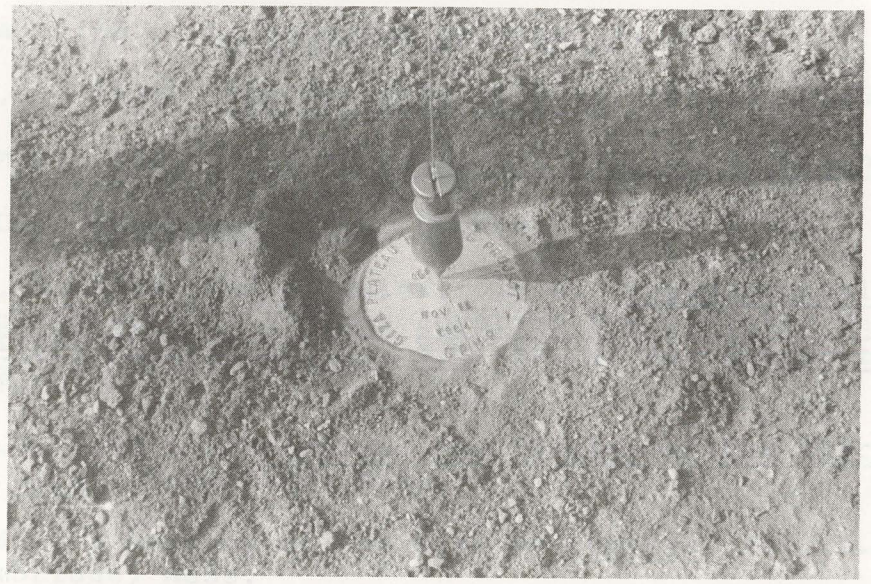


Fig. 2. Giza Plateau Mapping Project survey monument: 3½ in. aluminum disk.

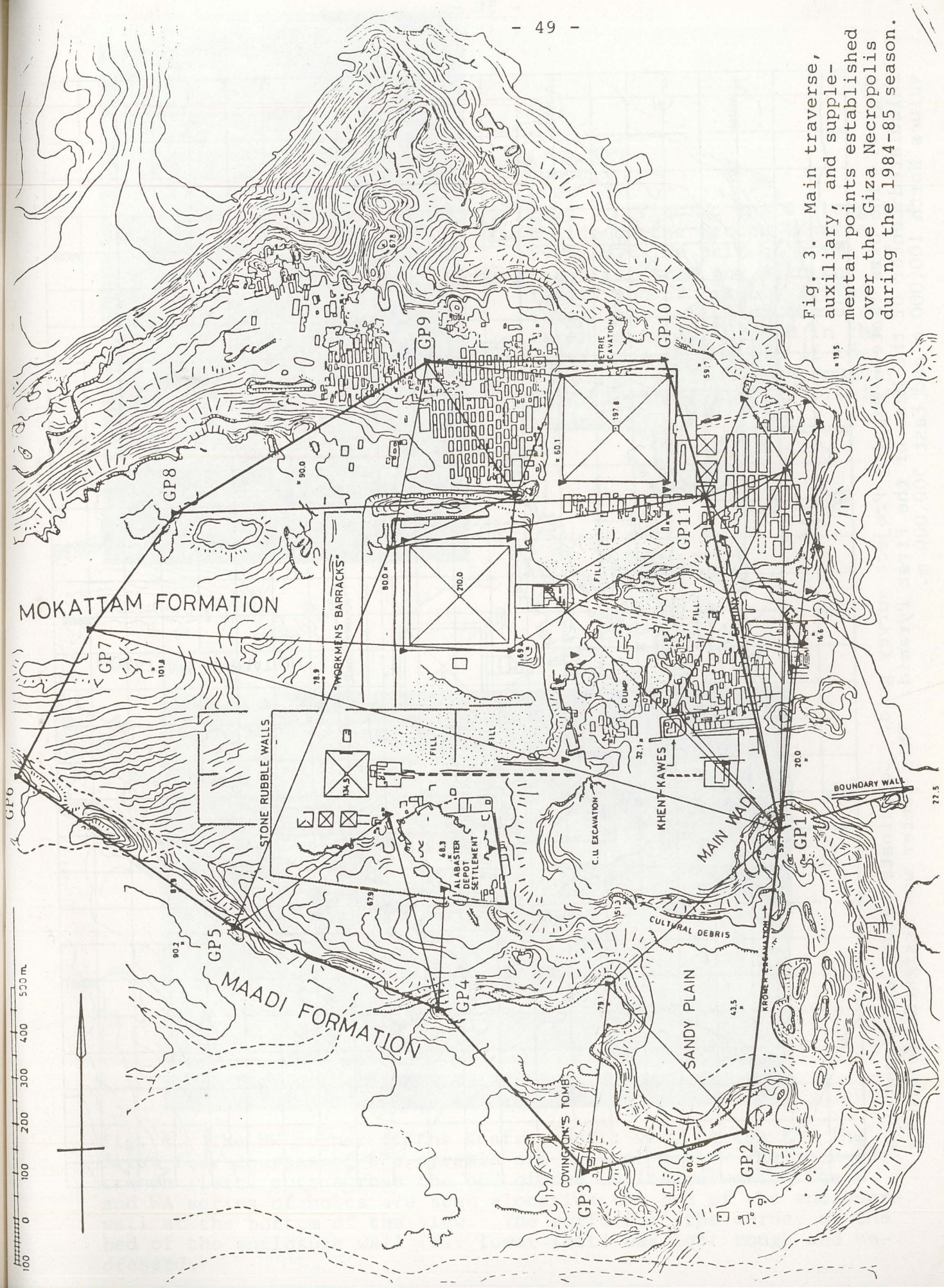


Fig. 3. Main traverse, auxiliary, and supplemental points established over the Giza Necropolis during the 1984-85 season.



Fig. 4. The Giza Plateau Mapping Project survey grid. Coordinate values are based on a calculated center of the base of the First Pyramid. This center was assigned coordinate values North 100,000 m and East 500,000 m.



Fig. 5. View to the S along the E side of the Second (Khafre) Pyramid. The pair of holes is the first from the N in the E (left) and EB (right) series. Toward the bottom of the view, three lines are etched in the outer edge of the bed of the enclosure wall. These roughly align to the E and EB hole-lines.

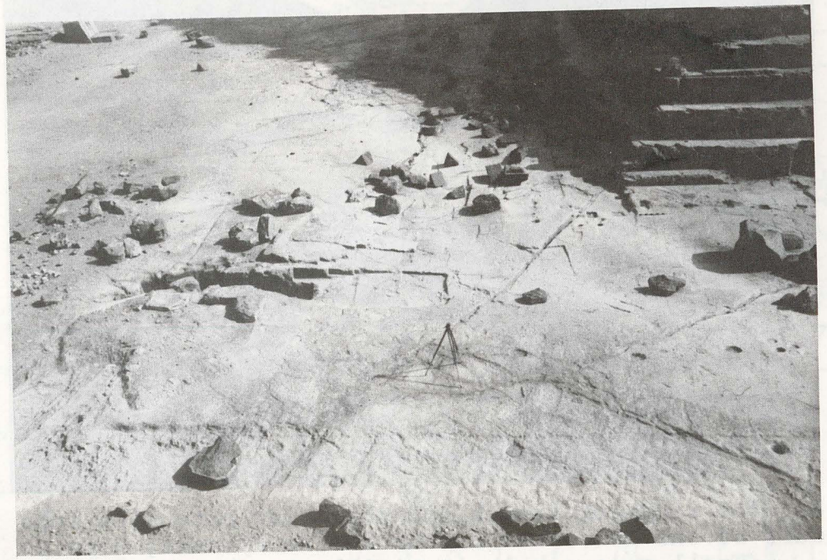


Fig. 6. The NW corner of the Khafre court; view to the E. The first four courses of the pyramid are natural rock. The rock-cut trench (left) cuts across the bed of the enclosure wall. The W and WA series of holes are seen alongside the bed of the enclosure wall at the bottom of the view. The surface at the corner of the bed of the enclosure wall (far lower left) was left rough and undressed.

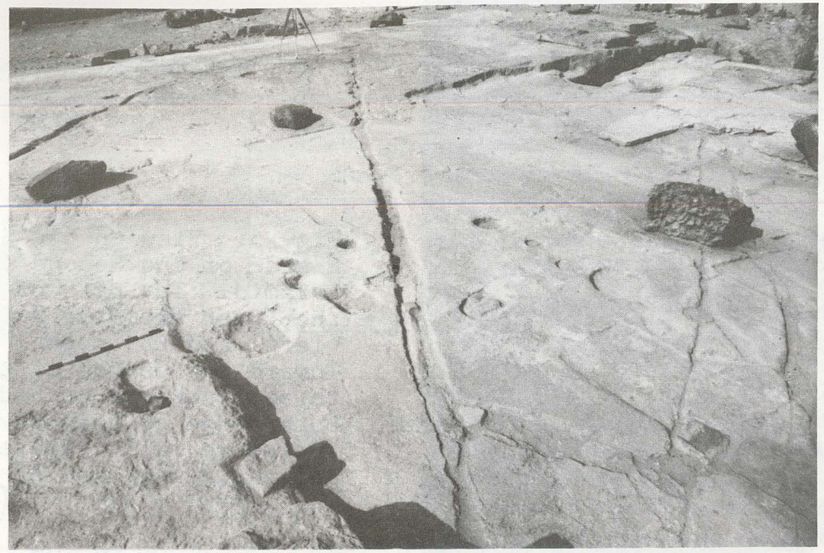


Fig. 7. The NW corner of the Khafre court; view to the NW looking down from the corner of the core massif. A large fissure cuts across the emplacement for the corner casing block. The rock-cut trench is in the upper right corner of the view.



Fig. 8. The rock-cut trench and shallower extension into the court at the NW corner of the Khafre Pyramid; view to the S. A small square hole is visible in the floor at the S end of the trench.

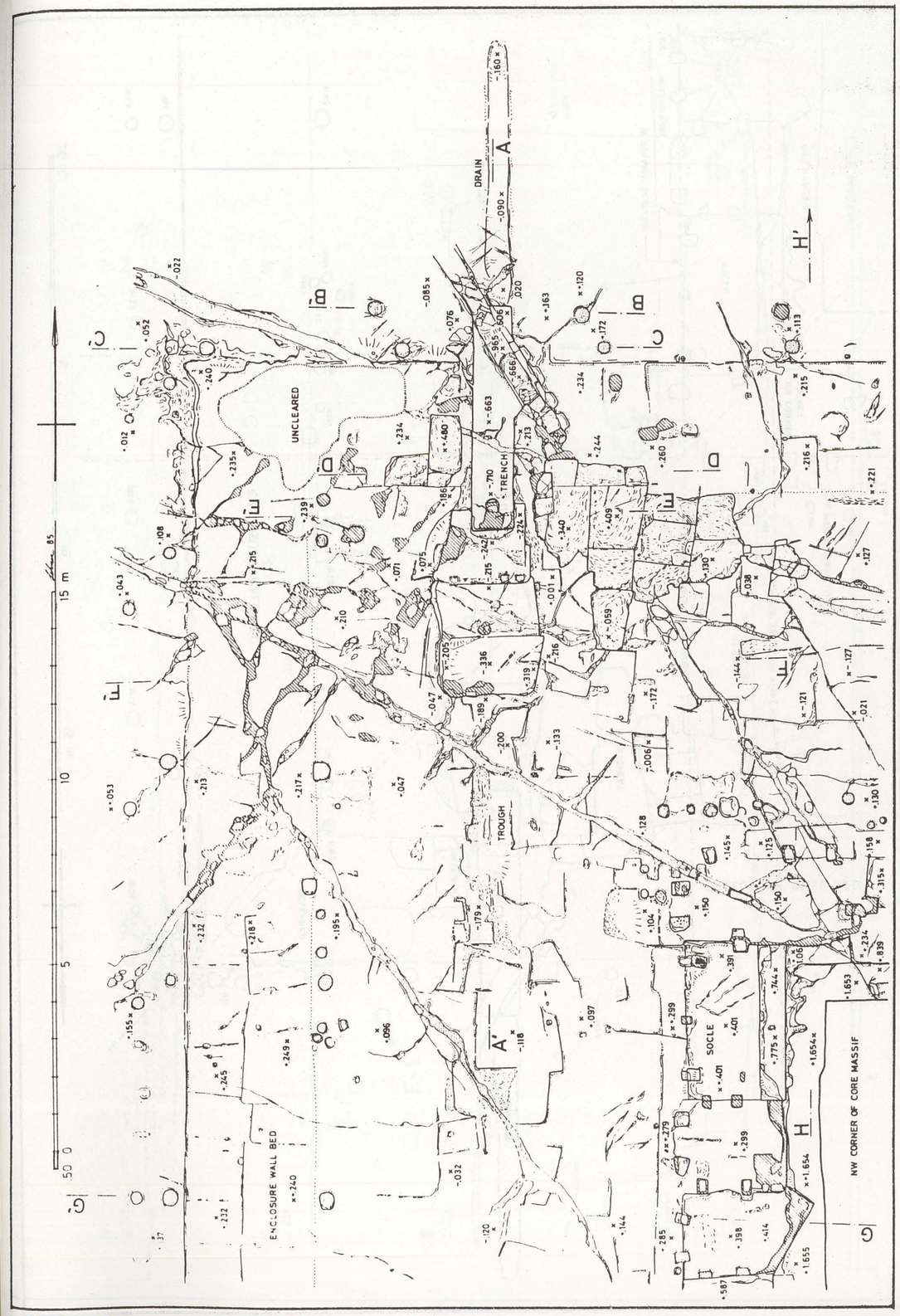


Fig. 9. Plan of the NW corner of the Khafre Pyramid court. Hatched areas are filled with gypsum mortar.

Fig. 10. Plan of the NW corner of the Khafre Pyramid court. Fissures and emplacement cuttings for the pavement and wall foundation slabs have been omitted. Alignments of features cut in the floor of the court with the pyramid are indicated by the dashed lines.

Fig. 11. Profiles of the NW corner of the Khafre Pyramid court. The locations of the profiles are shown in Fig. 9.



Fig. 12 (left). View to the S across the terrace at the NW corner of the Khafre Pyramid. The gridded quarry at the N side of the terrace is visible at the bottom.

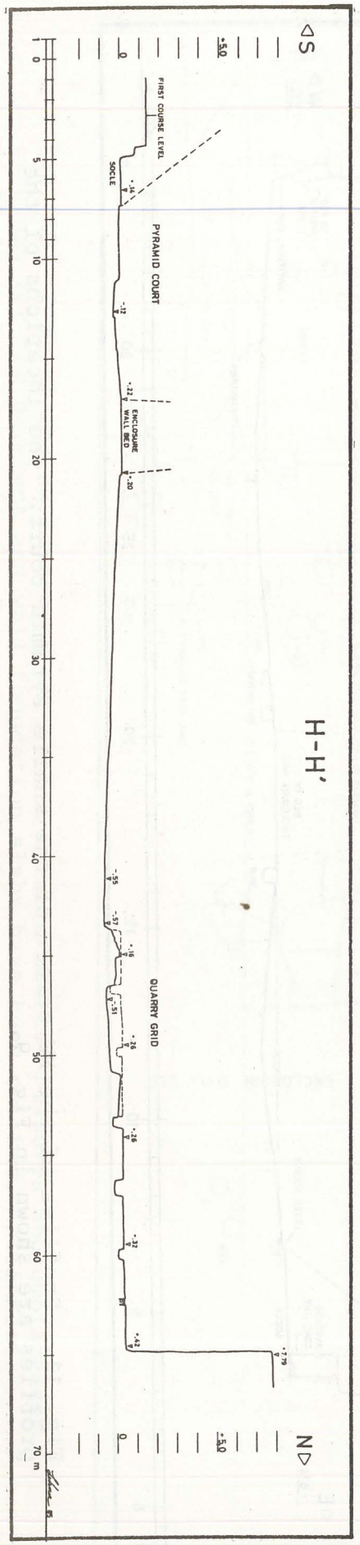


Fig. 13 (below). Profile from the NW corner of the Khafre Pyramid across the terrace and gridded quarry to the N. The location of the profile is shown in Fig. 9.

NOTES AND ANNOUNCEMENTS

Correction for NARCE 129

By mistake the article in our last issue on "Excavations at Kom el-Hisn, 1984" lost the name of its co-author during the process of revisions. It is important to add the name of Richard W. Redding who not only wrote this report with Robert Wenke but was co-director of the NSF project itself.

JARCE

Volume XX (1983) has finally arrived and it is important to remember our pledge to bring the Journal up to date. Considerable thanks are due to Gerald Kadish for long and meticulous devotion as editor and in particular for giving us three volumes in this one year alone.

With Volume XXI (1984) passing from galley proofs to final production, it is time to appeal for material for XXII (1985) and even XXIII (1986). If you have items to submit, please contact our editor John L. Foster, 2003 Lincoln Street, Evanston, IL 60201

1986 Annual Meeting

A preliminary announcement of the program committee and the call for papers has already been mailed. We will meet Friday through Sunday, April 18-20, 1986 in Washington, DC at the Washington Hotel (Pennsylvania Avenue at 15th Street, tel: 202-638-5900, 800-424-9540).

The program committee consists of the following three members:

Charles Butterworth
Department of Government and Politics
University of Maryland
College Park, MD 20742

Louis Cantori
Department of Political Science
University of Maryland
Catonsville, MD 21228

Edward Meltzer
Department of Religion
Claremont Graduate School
Claremont, CA 91711

Please communicate your desire to participate to the appropriate member of this comittee and also make reservations at the hotel, if you wish to stay there. Special rates for this meeting are $65 single and $77 double.

ARCE Fellows 1985-86

During the current year the following twenty researchers will receive ARCE financial support for their projects in Egypt. Several others not listed will join the Cairo Center program as recipients of Fulbright grants from other sources.

United States Information Agency

Joel S. Beinin
Stanford University
"Egyptian images of Israel, 1948-1956."

Selma Botman
Harvard Univeswity
"An Egyptian writer in exile: Albert Cossery."

Charles Butterworth
University of Maryland
"Averroes' Short Commentaries on Aristotle's Organon."

Ralph M. Coury
Connecticut College
"The socio-economic and Arabist policies of Ali Mahir."

Hani I. Fakhouri
University of Michigan, Flint
"Kafr al-Elow: a study of continuities and discontinuities of change."

Marcia Hermansen
San Diego State University
"Piety and Personhood: studies in the development of Islamic biography."

Richard C. Martin
Arizona State University
"Editing a Mu'tazilite MS. on Qur'anic theology."

Francis C. Mullaney
Harvard University
"Continuity and change: adaptive response by Egypt's ulema, 1952-1985."

Norman D. Nicol
Santa Rosa, California
"A study of the Fatimid coins in the Islamic Museum, Cairo: their place in the economic history of Islamic Egypt."

Suzanne P. Stetkevych
University of Chicago
Translation of Risalat al-Ghufran: manuscripts and annotation

Emily Teeter
University of Chicago
"Maat in the Amarna Age."

Marina A. Tolmacheva
Seattle University
"The Land of Waq-Waq and the Indian Ocean in medieval Arab geography."

Esther R. Warkov
Hebrew University
"The impact of urban Egyptian musical style on Iraqi improvised instrumental tradition as performed in Iraq and Israel."

John Waterbury
Princeton University
"A comparative study of parastatal enterprises: Egypt, India, Turkey, Mexico."

Sabra J. Webber
Ohio State University
"Egyptian folkoristics"

National Endowment for the Humanities

Ann M. Roth
University of Chicago
"Copying the Chapel of Wa'tetkhethor: the test of an epigraphic method."

Everett K. Rowson
Harvard University
"The Book of the Apple and the Platonic tradition on the soul in early Arabic philosophy."

Otto J. Schaden
University of Minnesota
"Investigations into the late XVIIIth Dynasty: the Tutankhamun-Ay shrine at Karnak and western Valley of the Kings projects."

Robert D. Springborg
MacQuarie University
"The politics of agricultural development in Egypt"

Jaroslav Stetkevych
University of Chicago
A study of contemporary Arabic poetry

DISCUSSIONS IN EGYPTOLOGY

Another journal for Egyptologists has begun in 1985. At the time this discussion was taken we were not aware of plans for Van Siclen's Varia Aegyptiaca. Upon further consideration, we decided that the great upsurge of ideas among Egyptologists in recent years will allow us all to flourish with a resulting even greater stimulus to Egyptological discussion.

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(b) We consider about 6-8 pages to be the ideal maximum for a discussion article for DE.

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